

ISSUES and ADVANCES in EDUCATION

U.S. Chaudhari

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EDUCATION

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in
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DR. U.S. CHAUDHARI

Foreword by
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FOREWORD

Education stands for the development of an integrated personality of an individual who in turn has to fulfil the duty of being the unit of a healthy society. Mere gathering of information or acquiring knowledge is not education. Development of a toddler into a truly educated adult depends on a large number of factors in which the home, the school, the teacher, the books, the environment and the society all play an important role. Sometimes, though not always, a seemingly innocuous incident like "one impulse from vernal wood....." may prove to be an educative experience of great value. Education is like a set of mathematical equations involving a very large number of variables, the significance of many of which may not always be quite clear and some of which may drastically affect the solution. Therefore, it is very difficult to fully regulate and control the process of education or the act of teaching.

In "*Issues and Advances in Education*" Dr. Chaudhari has dealt with the problems and innovations which face the educators and the society. An eminent educationist and thinker himself, he has posed the problems as well as suggested solutions thereof. His major thrust in this work is on the improvement of the procedural and material means of teaching to facilitate the release of creative potential of the learners.

Dr. Chaudhari has discussed the role of the teacher, in relation to other inputs of education, and particularly how textbooks and reading material alongwith other teaching aids can rightly fulfil the objective of teaching in terms of pupils' gain.

The presentation, though simple and straightforward, is illuminating as well as thought-provoking, and is useful to a layman and the specialist alike. The later category of readers will also profit from the exhaustive bibliography and references given in the book. I am sure the book will provide food for thought and invoke healthy questions and 'honest doubts' :

"There lives more faith in honest doubt,
Believe me, than in half the creeds."

—Tennyson (*Enoch Arden*)

Perhaps, the answers to these questions will generate new ideas and activity leading us to achieve the goal of developing a physically, intellectually and emotionally healthier man who can meet the challenges of the changing society.

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Questioning and Creative Thinking

Socrates (469-399 B.C.) was perhaps the first to point out that a question is a midwife which brings ideas to birth. He himself used to practice this "art of intellectual midwifery". In modern times, too, questions are regarded as a potent means of developing creative thinking in learners (Manson, 1970 ; Suchman, 1967 ; Taba, 1964 ; Torrance et al., 1970). Questioning is the most common technique of teaching practiced in classrooms ; indeed, effective questions are often equated with effective teaching. Rothkopf (1967) and Frase (1968) consider questions as an important form of instructional intercourse because they act as motivational stimuli and have arousal and associative outcomes. They are a major force in shaping the nature of students' thought and methods of inquiry.

Bruner (1959) maintained that one of the most important rewards of learning is the learner's ability to use the knowledge acquired to further his own thought. Bridging the gap between learning and thinking, however, requires a large expenditure of energy, and the process usually has to be incited by questions that go beyond what has been learned. It has been widely observed and reported that children enjoy learning when they think creatively. Discovery builds the self-esteem

of the discoverer, who also develops a sense of autonomy and intellectual potency (Suchman, 1967). According to Hunt (1961) there is an intense excitement and pleasure in data-processing as such; and questions are probably the best means of imposing "cognitive strain" on the learner so that he tries to invent systems for handling the data more efficiently.

Students' Questions

Those who have observed classroom teaching at any level—primary, secondary or university—very well know that students are rarely encouraged to ask questions in that setting. Calvin W. Taylor (1966) cites one study done at Pennsylvania State University in which the researchers checked to see whether many questions were asked during a given period at the college level. Surprisingly, their finding was that all of the 40 questions in a class hour were both asked and answered by the teacher. The average time allowed for each answer was of the order of four seconds. In Floyd's (1960) study, the ratio of teachers' questions to pupils' questions was found to be as high as 95 to 5 in some classrooms. Such classrooms, instead of being "centers of inquiry," have degenerated into "lesson-hearing rooms" where boys and girls are compelled to be mere passive consumers of facts and not investigative creators of ideas (Chaudhari, 1970).

Even in the teaching of science, the approach is overwhelmingly confirmatory rather than investigatory. In spite of this field's emphasis on inquiry and discovery, science has not in fact been given the attention and recognition it deserves as an intellectual nursery.

Students' questions are their "curiosity in action," their "mind hunger". In no case is inquiry, the birth-right of children, to be suppressed or thwarted. It is to be encouraged and faithfully nourished to ensure unfettered growth of the young person's creative potential. The questions of a creative child—even those that are unexpected, puzzling and unusual—should be sympathetically received and answered. Further, by employing Suchman's (1961) technique of "inquiry training," students can be trained to ask questions as precisely

as possible to avoid ambiguous answers. Suchman's experiments have abundantly indicated that his technique, systematically employed, can considerably improve learners' question-asking behaviour.

Teachers' and Textbook Questions

An increasing body of evidence suggests that the majority of classroom and textbook questions require little more than memorized responses (Adams, 1964 ; Botolome, 1969 ; Clegg, 1968 ; Chaudhari et al., 1972 ; Davis 1966 ; Farely, 1969, Fowlkes, 1962 ; Floyd, 1960 ; Hunkins, 1969 ; Sanders, 1966 ; Torrance, 1965). These studies have revealed that nearly 60 to 90 per cent of the questions asked in classrooms and set forth in textbooks never take the learner beyond the lowest cognitive process of Bloom's Taxonomy (Bloom, 1956) : i.e., knowledge and memory. Despite the high-level objectives often expressed in the curricula of various subjects. Students are seldom asked to apply, analyze, synthesize or evaluate the body of facts, concepts or generalizations they study.

Farely and Clegg (1969) reported in their investigation of classroom questions in the social studies that seldom was a question asked which went beyond the interpretative level of the Bloom-Sanders' Taxonomy.* In the Wisconsin School Improvement Program (1959-1961) study it was discovered that 90 per cent of the teachers' questions demanded no more than recall on the student's part (Fowlkes, 1962). Torrance and Hansen (1965), in their study of the question-asking behaviour of highly creative and less creative teachers, found that the percentage of divergent-provocative questions is rather low, just slightly above 10 per cent. The less creative teachers asked almost no questions in this category, less than 1 per cent.

Davis and Hunkins (1966) made a study of questions in social studies textbooks and concluded that 78 per cent dealt with knowledge of specifics. Of major note is the observation that of 732 questions studied, none required analytic

*Modified version of Bloom's *Taxonomy* (Sanders, 1966).

thinking, only one required pupils to engage in synthesis and two necessitated evaluative thinking. In a study of 711 textbook questions, Chaudhari and Jain (1972) found that 51.48 per cent of the questions called for memory only, while 11.6 per cent demanded interpretation and translation. Above that level, 10.04 per cent required convergent thinking and 2.10 per cent divergent thinking.

In the light of the studies discussed earlier, it can be concluded that the majority of the questions asked in classrooms or presented in textbooks are of low cognitive level. Torgenson's report on a study of pupil reaction (Fowlkes, 1962) is quite heartening in that there were only 18 out of 210 pupils who did not want to be asked more provocative questions.

Accordingly, efforts to increase the cognitive level of classroom and textbook questions must continue. In this direction, Torrance's analysis of the act of creative reading can be of immense use and interest to teachers and textbook authors. Torrance (1971) wants creative readers to deal with the material read at the following four levels :

- (1) Reproducing imaginatively what is read.
- (2) Elaborating what is read.
- (3) Transforming and rearranging what is read, and
- (4) Going beyond what is read.

In order to develop creative thinking in learners, questions asked in the classroom and those given in textbooks should make cognitive demands on pupils in terms of these four creative processes.

Although the role of questions is still imprecise (Hunkins, 1969) with regard to critical or creative thinking, a number of studies seem to suggest that if questions of the right type are put to them, pupils will be led to think creatively. A corollary to this inference is that teachers and textbooks writers are not being given proper training in the questioning techniques that will successfully stimulate higher levels of thinking in their classrooms and textbooks. Such training can be given in three phases (Farley, 1969). Phase One would

concentrate on encouraging teachers to ask questions demanding not mere recall, but interpretation and translation. Phase Two would emphasize questions requiring convergent thinking (application and analysis), while Phase Three would emphasize those calling for divergent thinking (synthesis and evaluation).

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Role of Questions in Thinking and Learning from Text

A major focus of education today is on facilitating thinking abilities in children. At a time when problem of the future can no longer be anticipated and mass persuasion techniques exert a greater influence on the public than ever before, pupils must be enabled to make responsible choices and decisions (Rogers, 1972). Education must equip the individual with a spirit of independence and a sense of adventure. It must also give a greater capacity for discrimination and judgement whereby he can make his own choice between conflicting norms and values of the pluralistic society in which he or she will be called upon to live. Even in the world of knowledge the emphasis in education has to be not merely on the mastery of extent knowledge but on the acquisition of a capacity to think, to assess facts and to arrive at one's own conclusions (Gore *et al.*, 1970). This is also necessary to meet the impact of change and to ensure 'soft landing' of the youth in the future (Chaudhari, 1972a).

Challenge to Education

Given further acceleration, knowledge will grow increasingly perishable. Today's 'fact' will become tomorrow's

'misinformation'. This is no argument against learning facts or data—far from it. But a society in which the individual constantly change his job, his place of residence, his social ties and so forth, places an enormous premium on learning efficiency. Tomorrow's schools must, therefore, teach not merely data but ways to manipulate it. Students must learn how to discard old ideas, how and when to replace them. They must in short, learn how to learn (Toffler, 1970). Schools of the future will be designed not only for 'learning' but for 'thinking'. More and more insistently, today's schools and colleges are being asked to produce men and women who can think, who can make new scientific discoveries, who can find more adequate solutions to impelling world problems, who cannot be brain-washed, men and women who can adapt to change and maintain sanity in this age of acceleration. This is the creative challenge to education (Torrance, 1967).

Textbook Questions : Importance and Research

A ubiquitous aid to teaching is the textbook. It is an important means of transmitting indirect experiences and information to the students in a large and well organised amount. It imbibes the experiences lived and breeds thoughts, attitudes and dispositions yet unborn in the minds of learners. In order to attain the objectives of language teaching, linguistic and ideational contents are included in a good language textbook (Rastogi, 1972). It is claimed that a well written and carefully edited textbook can invite creative response and can act as a guide to discovery (Hilton, 1969). Fulfilling this function authors and publishers use specific devices and aids to assist and stimulate the pupil reader to learn the material presented and to use the knowledge acquired in thinking. Prominent among these special aids are questions, certainly found at the end of chapters or unit subdivisions. A textbook is a "library of questions" for the student teachers, practicing teachers and the paper setters. They generally refer to the questions given in the textbooks to use them in the classroom and to set them in question papers. Thus, the textbook questions play a vital role in the instructional intercourse.

The art of questioning is probably the most ancient pedagogical method. The dialogue of Socrates and dialectics of Plato have often been considered the epitome of intellectual discourse, and have been used throughout history as a model for all teachers and textbook authors. Socrates (469-399 B.C.) was perhaps the first to point out that a 'question' is a midwife which brings forth the birth of ideas from mind. He himself used to practice this "art of intellectual midwifery". Presently, educators are still advocating the use of effective questions and questioning strategies to trigger thinking (Aschner, 1961 ; Bruner 1959 ; Loughlin, 1961 ; Manson and Clegg, 1970 ; Suchman, 1961, Taba, 1966 ; Torrance and Myers, 1970 ; Wellington and Wellington, 1962). In their studies on mathemagenic activities,* Rothkopf et al. (1967) and Frase (1968) found post questions as an important form of instructional dialogue because the questions act as motivational stimuli and they have arousal and associative outcomes. By evoking and strengthening the learning behaviour the questions shape the nature of pupil's method of inquiry and thought in a practically important sense. Bruner (1959) maintained that one of the most important rewards of learning is to be able to use the knowledge acquired in thinking. Bridging the gap between learning and thinking, however, require expensive energy and usually has to be released by questions that go beyond what has been learned (Torrance and Myers, 1970).

Given the general agreement on the importance of questions, the research on the entire area of questions was sparse. In the last decade interest has been renewed in researching the question. Small number of studies made in the field of classroom and textbook questions (Chew, 1966 ; Davis and Hunkins, 1966 ; Windley, 1966) have revealed that the cognitive level of majority of questions presented in the textbooks is very low. These questions are limited to those that require little more than a memorized response. Despite the high level objectives often found in the curriculum of various subjects students are seldom asked to apply, analyse, synthesize or evaluate the

* Which gives birth to learning.

body of facts, concepts or generalisations they study (Farley, 1968).

The investigation of the instructional effects of questions is by no means a new experimental area (Distad, 1927 ; Holmas, 1931), yet very little precise information is available to tell us how questions work. As early as 1929 studies (Nudelman, 1929 ; Mead, 1939 ; Lucas, 1941) were made to analyse the cognitive level of textbook questions. Authors of these studies attempted to tabulate, for example, the number of textbook questions which call for reasoning as opposed to memory. These studies usually show much room for progress, while also showing that progress has already been made.

Davis and Hunkins (1966) motivated by the question : "what cognitive objectives are served by questions in social studies textbooks," conducted a study of questions of three fifth-grade social studies textbooks. One-third of the chapters in each were randomly selected. All questions from these chapters, primarily found at ends of chapters were listed. Questions from textbook 'A' emphasizing a History approach totalled 139 ; from textbook 'B', with a geography emphasis, numbered 350 ; and from textbook 'C', described as having fused approach, had 243 questions. The analytic scheme employed in judging the cognitive emphasis of these questions was the *Taxonomy of Educational Objectives : Cognitive Domain* (Bloom, 1956). Perhaps the most surprising finding of all is that the three books written along different approaches, were so similar in the cognitive emphasis of their questions. Not only were they alike with respect to an emphasis on knowledge, their questions revealed a uniform neglect of the higher mental operations. As might have been expected, an overwhelming majority of the questions in each textbook were concerned with knowledge. The large percentage of questions in the general category of knowledge, while impressive, does not reveal the impact of the overall emphasis. Probably more significant is that of all 732 questions, 78 per cent dealt with knowledge of specifics. Only 13 per cent of the questions belong to higher thinking processes. Of major note is the observation that in these three textbooks, none of the questions

studied required pupils to engage in synthesis, and only two questions necessitated evaluative thinking.

Hunkins (1966) reported that sixth grade pupils' social studies achievement was increased by using text type materials which incorporated questions emphasizing higher-level cognitive operations. In this study Hunkins sought to determine whether a dominant use in social studies text type materials of analysis and evaluation questions, as defined by Bloom's *Taxonomy* would effectively stimulate the development of sixth grade pupils critical thinking. The general plan of the study first involved two sets of text-type materials and corresponding answer sheets, one stressing questions requiring analysis and evaluation (condition A) and the other containing questions stressing knowledge (condition B). Pupils in both treatment conditions were directed to read designated sections of their textbooks and to respond to the questions on their work sheets. The Social studies Inference Test was used as the criterion test of critical thinking. The test does not yield a single 'critical thinking' score, but rather, scores on four aspects of critical thinking : Inference, caution, over generalisation and discrimination. The 'Inference Test' was administered as both a pre-test and a post test.

The author of this study concluded that the dominant use of analysis and evaluation questions did not produce significant differences between the two treatment groups. The role of the question is still imprecise with regard to critical thinking. The failure of the high level questions to stimulate such thinking forestalls the simple conclusion that if the right questions are framed, pupils will think critically. The findings possibly suggest that the knowledge question has more value than it has been accorded in the stimulation of thinking. Additional research is however requisite before any definite statement can be made.

In a study by Chaudhari (1972 b), 711 end-of-lesson questions of Nationalised Hindi Textbooks of Madhya Pradesh were classified into different cognitive categories of Bloom Sanders' *Taxonomy* (Sanders, 1966). He found that 51.48 per cent questions were at memory level, 11.6 per cent at above memory (Translation and Interpretation), 10.04 per cent at

convergent thinking (Application and Analysis), and 2.10 per cent at divergent thinking (Synthesis and Evaluation) level. Of major concern is the finding of this study that, besides a very few questions under 'Activity', the number of questions on linguistic content was considerably low (11.81%) as compared to ideational content.

Questions and Learning from Text

Anderson (1967) states that a question is a critical variable for controlling learning behaviours. According to him the most compelling stimulus in a frame is the question which must be answered or the blank which must be completed. A basic problem involved in the effective control of learning behaviours notes Frase (1968), thus may not be whether the material is broken into small steps or physically separated stimulus and response terms, but whether the method of instructional control (be it a programme frame, a question, or a graph) gets the student to practice the stimuli and responses, and to make the appropriate associations between the two. Learning from connected discourse, according to this model, would be similar to paired associate learning in that more than one stage may be required to achieve mastery of the material. The point here is that there are several alternative ways of getting subjects (Ss) to go through the behaviours involved in these separate stages, and the use of question is one of these ways.

Hershberger and Terry (1965) found that a confirmation procedure was least effective in a programmed learning task. The Ss who were given the correct answers (confirmation) presumably did not read the stimulus material carefully. These authors concluded that question difficulty (availability of correct response) was an important determinant of learning. Rothkopf (1965) also found that if the correct response is easy to predict less will be learned. The most difficult questions evidently require Ss to process the words to which they are exposed since they learn more. The basic problem, however, is to determine what specific stimulus controls cause Ss to retain more when difficult questions are asked.

A study by Mechanic (1962), sheds some light on this

problem. Using a paired-associate task, he found that the nature of the responses required by an orienting task (which related to different cues in the stimulus lists) was of crucial importance for learning. If the cues used in the orienting task (which might be questions) are relevant to the experiment's criterion, then Ss will score relatively high. Faust and Anderson (1967) found that making a programme frame more difficult by adding irrelevant stimuli led to better retention because Ss had to at least notice the relevant stimuli. Another way of stating this would be that Ss were forced to respond discriminately to the stimuli when irrelevant components were added.

Questions can be used effectively because they function to control Ss' attention. Berlyne (1965) maintains that attention is a negative process—it consists of information rejection. A precise question, such as asking for the name of an author, date of birth, etc., might allow S to ignore all but one sentence of a reading passage. If the questions were more general, for instance asking which of two poets was born earlier, S would have to take more of the information into account in order to answer the question. Schroder, Driver and Streufert (1967) also emphasize the view that information rejection is a concomitant of attention. They point out that Ss "filter" inputs (by rejecting certain information), and that more filtering will occur as the information load is increased. Information load may increase to a point at which Ss will abbreviate the task at hand, adopting what may seem to be an optimal strategy. Under high load, for instance in a lengthy connected discourse task in which reading behaviours are not precisely controlled, overall retention of the passage would decrease if Ss adopted a strategy which omitted some necessary step, such as practicing stimuli, practicing responses, or associating the two. On the assumption that learning from connected discourse involves both a response learning and associative phase, it is clear that questions which are to be used as instructional aids must be phrased in such a way that Ss are directed to rehearse the stimuli, the responses and also the associations between the two (Frase, 1968).

Summarising research-studies on learning from text (or

written materials) Frase (1970) has stated three characteristics of questions influencing learning: (a) their position in a text, (b) the contiguity of questions and related content, and (c) the type of question. In general it was found that Ss learn most when the questions come after the material to which they relate. Post-question groups also retained somewhat more incidental information. The post questions work best when the motivation is low. There were no differences in retention between pre- and post-question groups when the questions occurred every 50 sentences; but when a question occurred after every 10 sentences, the post-question groups scored about 40 per cent higher on overall retention than the pre-question groups. Therefore, contiguity of the questions and their related content might work either for or against overall retention, depending upon the point at which the reader views a question, i.e., immediately before or after he reads the text.

There is little doubt that the type of question posed is an important determinant of the behaviours that the reader will exhibit. For instance, Rothkopf and Bisbicos (1967) interspersed in a text those questions related to either common or technical terms. Their design involved pre- and post-question groups. The post-question groups that had seen technical term questions showed high recall of other technical terms. Questions as orienting stimuli, might thus define category cues that can determine a broad class of stimuli to which the Ss will respond. Frase (1968) explored the effects of pre-questions that vary in the amount of material to which they relate. Subjects were asked to underline the amount of information in a text which would be required to answer a specific pre-question, a comparative question, or a general question. The Ss responses indicated that the number of words perceived to be necessary to answer the questions increased in the order of specific, comparative, and then general questions.

Text Questions and Creativity

Since text or written materials provide perhaps the best invention yet for becoming educated, it might be that we should put a large share of our creative energy into inventing ways

of making books more effective for evoking creative behaviour (Torrance, 1964). The text inhibits creation when it advocates "the one best way"; it encourages creation when it organises past experience so that the learner can grasp its value and limitations (Cronbach, 1955). The text can also promote creativity by developing problem-solving ability among the learners. The textbook exercises or end-of-lesson questions are perhaps the best means to stimulate divergent thinking or creative behaviour among the pupils through textbooks.

What is essential for creativity is that the exercises or questions should provoke readers to think of multiple possibilities and ways of tackling a problem. The reader should be encouraged to associate different ideas, meaning and concepts in order to find a solution or to arrive at certain conclusion. Students should also be enabled to elaborate and transform the material learnt and to go beyond what they have read in their books (Chaudhari, 1970).

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Textbook Questions and Cognitive Processes

The textbook is one of the major variables conditioning and controlling the quality of education; hence, the need to improve textbooks is a perennial subject pointing to a task that will be completed only when textbooks are dispensed with (Tibbetts, 1967; Dave 1971). Much effort has been invested in the improvement of textbooks with respect to aspects such as readability, legibility, pictorial and graphic presentations. However, one very important aspect—textbook questions, reflecting the objectives of teaching and the expected standard to be achieved by the students—has remained more or less the same. Since books provide perhaps the best means yet invented for becoming educated, it may be we should put a large share of our creative energy into inventing ways of making textbook questions more effective for evoking creative behaviour (Torrance, 1964).

Textbooks may be viewed as 'question banks' from which teachers and examiners draw questions to ask pupils in the classrooms and on standardized examinations. Textbook questions also act as motivational stimuli having arousal and associative outcomes (Fraser, 1968). They can evoke and strengthen the learning and thinking behaviour of the readers, a point made by Guthrie (1942) : "... (A) student does not learn

what was there in a lecture or book. He learns only what a lecture or book causes him to do." In sum, questions are probably the single best means of imposing or removing 'cognitive constraint' on the learner.

Related Research

From the time of Socrates, educators have used questions as an important tool to trigger thinking. Presently, they are still advocating the use of effective questions and questioning strategies to stimulate thinking (Aschner, 1961; Loughlin, 1961; Wellington and Wellington, 1962; Manson and Clegg, 1970; Taba, 1970). But empirical research presents an increasing body of evidence that the majority of textbook and classroom questions are low on the cognitive emphasis scale and require little more than a memorized response. (Floyd, 1960; Adams, 1964; Chew, 1966; Windley, 1966; Davis and Tinsley, 1967; Schreiber, 1967; Clegg, 1968; Bortolome, 1969; Farley, 1969; Hunkins, 1969; Rogers, 1972). Despite the high level objectives often found in the curriculum, students are seldom asked to apply, analyze, synthesize or evaluate the body of facts, concepts or generalizations they study (Chaudhari, 1972 b).

Purpose of the Study

Textbook questions indicate the objectives of teaching and the standard to be achieved by the students. What a test item or question measures is determined not by the Overt response but by the thought process that precedes it (Ebel, 1970). The purpose of this study, therefore, was to investigate the cognitive processes stimulated by the textbooks questions by classifying them into the following hierarchical categories of Bloom Sanders' *Taxonomy* (Sanders, 1966) :

1. Memory
2. Translation
3. Interpretation
4. Application
5. Analysis

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6. Synthesis, and
7. Evaluation.

Procedure

In this study 711 questions from Nationalised Hindi Textbooks (Class I through VIII) of Madhya Pradesh were collected and categorized. Activity questions were excluded in the study. Each question was carefully examined in terms of its potentiality to foster the cognitive process described by Sanders (1966). Whenever the investigator could not determine the category of a particular question, it was referred to a "Board of Judges" and the final decision about the category was made on the basis of their combined opinion. The board of judges included four members—two methodology and two content experts; each judge was a practicing college teacher holding a master's degree in education. Each category of Bloom Sanders' *Taxonomy* was explained to the judges and a condensed version of the *Taxonomy* was supplied for ready reference. All questions were eventually classified.

Analysis and Findings

As indicated in Table 1, out of 711 questions 366 (51.48 per cent) belonged to the Memory class, 63 questions (8.86 per cent) to the Translation class, 102 questions (14.34 per cent) to the Interpretation class, 113 questions (15.84 per cent) to the Application class, 37 questions (5.20 per cent) to Analysis class, 14 questions (1.25 per cent) to the Synthesis class and 16 questions (2.96 per cent) to the Evaluation class. The fact that the highest number of questions were in the Memory category and lowest number of questions were in the Synthesis category suggests that in text-book under study, least emphasis has been laid on evoking the creative behaviour of the learners with greatest emphasis on memorization.

Table 2 presents the classification of the questions into convergent and divergent thinking categories. Out of 711 questions 366 (51.48 per cent) questions were of Memory type, 165 (23.20 per cent) questions Above Memory type, 150 (21.09

TABLE 1

**Classification of Questions into Bloom
Sanders' Taxonomy of Cognitive Process**

N = 711

<i>Cognitive Processes</i>	<i>Number of questions</i>	<i>Percentage</i>
Memory	366	51.48
Translation	63	8.86
Interpretation	102	14.35
Application	113	15.85
Analysis	37	5.20
Synthesis	14	1.25
Evaluation	16	2.96

TABLE 2

**Classification of Questions into
Convergent and Divergent Categories**

N = 711

<i>Thought Processes</i>	<i>Bloom Sanders' Taxonomy Categories</i>	<i>Number of Questions</i>	<i>Percentage</i>
Memory	Memory	366	51.48
Above Memory	Translation & Interpretation	165	23.20
Convergent Thinking	Application & Analysis	150	21.09
Divergent Thinking	Synthesis & Evaluation	30	4.21

per cent) questions Convergent thinking type and 30 (4.21 per cent) questions Divergent thinking type. This finding demonstrates that most of the questions require students to memorize

the facts, concepts principles and generalization, while few attempts have been made to design questions which would foster the divergent thinking ability of the pupils. This confirms Gallagher's (1965) study in which he also reported that a high frequency of cognitive memory questions results in a correspondingly high proportion of convergent responses, thus limiting sharply, the likelihood of divergent or creative activity on the part of pupils.

Discussion

The findings of this study are consistent with Davis and Hunkins (1966) who discovered that none of the 732 questions they studied required analytic thinking, only one required pupils to engage in synthesis and only two questions necessitated evaluation thinking. Other studies of classroom and textbook questions are also corroborated by the present study. (Bortolome, 1969; Clegg, 1968; Davis and Tinsley, 1967; Farley, 1969; Fowlkes, 1962; Guszak, 1967; Hunkins, 1969). Although the exploratory nature of the study and the sample of questions drawn from one set of books does not permit wide generalizations, it does indicate that teachers should use these textbooks questions with caution because the higher cognitive objectives of teaching Hindi, particularly those associated with creativity, are probably not attainable through such questions.

Two definite conclusions may be drawn from this study. First, as an analytical tool, the Bloom Sanders' *Taxonomy* enables us to ascertain the kind of mental processes we are encouraging, or perhaps neglecting in textbooks. Thus, the *Taxonomy* could serve as a common educational language for the improvement of instruction. Second, teachers and textbook-writers need adequate training in designing and asking questions to successfully implement the higher levels of thinking in textbooks and classrooms. Hence, it appears desirable to include study of *Taxonomy* in teacher training curriculum. Farley (1969) has suggested this can be done in three phases. Phase One would concentrate on encouraging teachers to ask 'above memory' questions (translation and interpretation). Phase Two would emphasize convergent thinking question (application and

analysis) while Phase Three would emphasize divergent thinking questions (synthesis and evaluation). Implementation of this suggestion would probably do much to improve classroom questions. As majority of textbook authors are teachers this would also raise the cognitive level of textbook questions.

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Textbooks and Creativity

It cannot be the aim of teaching at school or college merely to accumulate knowledge. It is much more a matter of teaching the processes by which knowledge is produced. By teaching the process we establish learning most acceptably as a continuing endeavour and not as something which comes to an end when schooling finishes. By means of the process we use knowledge not just as a composite mixture of information but as a system of learning. Textbooks are the principal teaching tools which attempt to present knowledge as a system of learning.

Textbooks are generally criticised on the count that they exert too strongly a conservative influence. They block creativity in teaching and learning. Margolis (1965) observes that today's textbooks are pleasant to look upon and easy to read, but they lack rough texture of honesty—the kind of gritty detail that slows up the reading but speeds up the thinking. Sanders (1966) also notes that, although, many textbooks are attractive, accurate, readable and understandable but they are the biggest deterrants to thinking in the classroom, because the authors assume that students learn best by studying a polished product. They are highly refined and as near perfection as a human mind is capable of making them—but the author does

the thinking. The book never gives a clue that the author pondered over hundreds of decisions. The result is that the creative process and the controversy of competing ideas are hidden from the students.

On closely examining the charges levelled against textbooks, one is likely to say that in order to escape the limitations created by the past it would not be wise to forget the past altogether. The text is always a means of carrying forward into future whatever insights, customs, and techniques have been found serviceable in the past. It is not possible to insulate the learner from the culture in which, for better or worse, he finds himself. The problem, then, is : how to make more and more of his culture useful for him. The text is a device for helping the child fit into his culture, but culture need not be passed unedited, good and bad aspects alike. In fact, the nature of the text itself demands that its maker be highly selective in the materials he or she presents. The text maker who lets the learners have the knowledge considers of most value. Therefore, text can actually serve as a vehicle for social reform. Rather than becoming unduly conservative, proper textbook can be a modernizing influence. It is not that it is in the nature of texts to be conservative. Text can and should be fully contemporary in spirit and content. Good textbooks like good teachers want to stir learners to an ambition to make their own revolutions.

It is generally believed that textbooks pass on the ideas of the past and thereby stifles the independent thinking and creativity of young people. This can be true only if textbooks are written so as to suggest that the content is endowed with a questionable perfection. One should be cautious in criticizing the text for having an authoritative tone. A good textbook should be authoritative in one sense. Its presentation of subject-matter should be reliable, accurate and true to scholarship. What is meant, then, when it is said that learning is a creative act? What do we mean when we encourage the learner to criticize rather than passively accept knowledge? Does this suggestion mean that the learner should develop his ideas by himself, using none of the resources of his culture? This would be an eminently Rousseauian position, and an impossible

one. It violates our whole knowledge of the nature of civilization and its value (Cronbach, 1955). Perhaps the phrase "Creative learning" implies that the culture can limit, as well as facilitate, the process of thinking. This would not lead us to reject the textbook as a resource in education, but it might suggest that we use it only in the most appropriate ways. The textbook would be supplemented by, or make provision for, creative opportunities. The text inhibits creation when it advocates "the one best way", it encourages creation when it organizes past experiences so that the learner can grasp its value and limitations.

Students deserve the right to participate in the thinking. They deserve the right to reason with raw indigested ideas. They are not ready to take over all the thinking functions of the writers, but they can take over part of them. To accomplish this in a text the author might stop his explanatory function at various points and, in effect say to the students: "the next ideas to be developed is one you can think out if I give you the raw material. This is an important idea and will be used later in the text. Give it your serious thought" (Sanders 1966). Thus, a well-written and carefully edited textbook can invite creative response and can act as a guide to discovery (Hilton, 1969).

Perhaps the major fault with textbook education is that it appears to be positively antithetical to education for critical thinking. The argument is this that texts are traditionally regarded as infallible authorities and everything possible is done to make them infallible. Students who go through years of experience in accepting what the text says are continually confirmed in the attitude of accepting the printed word without question. A contrary supposition that the printed word is somebody's statement to be believed only after scrutiny and testing, is necessary for the reader who is trying to solve any problem outside the school (Cronbach, 1955).

Much depends on how does a teacher make use of a textbook? A textbook cannot act as a "pied piper" for the teacher. He should invest efforts to modify the material given in the textbooks to suit his specific purpose. This purpose is to arouse the curiosity and shape the method of inquiry and

thought of the pupils. It is also observed that the text materials prepared to make students critical and creative are used in a way which further reinforce the medieval concept of the text as authority. Preparation of text materials which give pupils from the earliest grades a chance to suspect the word in print and to think beyond the lines, is an ideal worth suggesting to innovative teachers and textbook authors.

Manu Desai (1977) has rightly remarked that we are not preparing children to face life. Twenty years hence, the present generation of children will blame adults for their sins of omission and commission. They will say that they were provided with badly printed, ill-illustrated, old-fashioned and puerile books, films, TV programmes and music. This can be prevented by a sensitive identification with children, asking artists to illustrate for the child the world in the form, colours and texture, as perceived by the very young, and helping them on to an expression of their creativity.

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Preparing Creative Science Textbooks

Modern civilization is permeated by the dazzling glamour and power of science. In fact, "science has done more" says Dr. Radhakrishnan "for the emancipation of the masses than the wisdom of the ages". Science is an indomitable instrument of social change. Scientific advancements have transformed the configuration of the external world. As a social and practical activity science is superior to art. Late Bertrand Russell has highlighted this superiority of science over art. He observed : "It is because science gives the power of manipulating nature that it has more social importance than art. Science as the pursuit of truth is the equal, but not the superior, of art. Science as a technique, though it may have little intrinsic value, has a practical importance to which art cannot aspire."

Authors of science-textbooks pay scant attention to the social and practical value of science. The traditional "Formal discipline" approach is still haunting whole of the panorama of teaching and learning of science. No deliberate attempt is made to teach science for transfer, whereas the experiments and studies on 'transfer of learning' have established that transfer is deliberate and not automatic. Neither the teachers nor the textbook authors attempt to organise the subject

matter in such a way as to enable the learners to make generalisations, to weigh evidences, to draw conclusions and to play fair with the facts. We are making our boys and girls merely conformist consumers of facts and not the investigating creators of ideas. We have failed to ignite in them an irrepressible zest and zeal for "learning how to learn". All these years, science as an intellectual nursery leading to "inquiry" and "discovery" has not been given due attention and recognition it deserved.

Textbook in Indian Schools

Every subject of study has mainly two aspects—the disciplinary aspect and the cultural aspect. And so the subject matter is to be presented with these two aspects in view. "Of course in science subjects norms or the philosophy of life or the philosophy of the subject cannot form a part of the textbooks at the earlier stages. It will constitute a subject by itself for the students of mature minds at a later stage. But in the earlier stage the norms should reside in the minds of the teachers and for their direction they can be elaborated in introductory notes in the textbooks. In humanities the question of norms will remain predominant at all stages" (Seth 1969).

Function of Science Textbooks

Textbooks are a means of supplying indirect experience in a large and well-organised amount. As they are addressed to the immature learners, their subject matter is presented in a selected, simplified and ordered way keeping in mind the age, ability and interest of the students for whom they are meant. Thus on the one hand the textbooks give an outline of the subject matter and also gives some suggestions to the teachers as regards the methodology of teaching and activities to be organised for the pupils. This double role of textbooks towards the teachers and pupils will specially embrace the following points :

1. Textbooks help in keeping continuity in the treatment of the subject in different classes and stages,
2. provide the basic knowledge for a particular class at one place in some well organised manner,
3. provide situations for applying the knowledge to effective use along with some suggestions to tackle them, and
4. develop curiosity and need for further study.

Science Textbooks and Syllabus

Syllabus and textbook draw inspiration and support from each other. As a matter of fact their function is both complementary and supplementary. The books make the course as often as the course makes the books. As Sinha (1969) has pointed out: "A textbook is a powerful tool to convey the conceptual ideas included in a course to the students. It is the textbook which only can remove the deficiencies of a syllabus." The 'Alphabet' courses starting from P.S.S.C. (Physical Science Study Committee), then S.M.S.G. (School Mathematics Study Group), B.S.C.S. (Biological Science Curriculum Study) and C.H.E.M. (Chemical Education Material Study) in U.S.A. and the books prepared under the leadership of the 'Nuffield Science Project' in England are the pioneer works which have often led, enlightened and embellished the syllabus.

Role of the Writer

"Textbook writing" says Ernest Hilton "is a skill, even with some claim to being an art. Once the skill is learned, its exercise is in some measure self-rewarding." Writing of science-textbooks is in no way an exception to this viewpoint. A textbook in science may rank very high in authorship, if long experience in the field of teaching the subject be combined with years of scientific investigations. Preferably, a panel of authors can produce a better and improved product. Experienced Professors of the universities and colleges of education, school teachers and textbook specialists may be associated in the task. The layout and design of illustrations

should be entrusted to artists with a specialised knowledge and proficiency in drawing illustrations for children and adolescents. The authors and the artist should work in close collaboration.

Before launching upon writing a textbook the author or authors should clearly define the objectives of teaching the subject. They should also carefully interpret the syllabus to give a concrete shape to the ideas and concepts envisaged in it. A textbook is not an end in itself but an effective instrument of realisation of certain aims and objectives related to the demands of the subject in particular and the educational needs of children in general. So, in their keenness to cover the prescribed syllabus and to narrate the facts in rigidly logical sequence, they should not be oblivious of the disciplinary and cultural values underlying the study of the subject.

Organisation of Subject-matter

A textbook is different from an ordinary book so far as its technique of organisation is concerned. In fact, a textbook is a textbook by virtue of the principles which control its organisation of subject-matter. Hence, a balance between contents and technique of organisation is the foremost requisite of a good science-textbook.

Experts opine that the contents should be organised, as far as possible, in unit plans. These units should be natural in the sense that only related ideas should be put together. If necessary, the broad units may be divided into suitable topics and the topics may further be splitted into reasonable concepts supported by appropriate activities.

Principles of Subject-matter Organisation

1. The courses shall be organised into units, each of which shall be related to significant aspect of the environment.
2. The unit shall be essentially a major problem of every day life, to which science may contribute the intelligent basis for human adjustment.
3. The continuity of the units shall be such that the entire

course develops a sequential story of man's understanding of, and adjustment to, his whole environment.

4. In general, the units and the subordinate problems within each unit shall proceed in line with the scientific method of problem-solving ; that is :
 - (a) from sense perception of materials, forces, or phenomena to the formulation of ideas, to the testing of hypotheses, to the tentative conclusions in life situation, or
 - (b) from principles or generalisations to the interpretation of specific situations.
5. The distribution of time and emphasis to the various units shall be determined, by the total, functional social value of the unit, its 'teachability' and 'learnability', the teachers and the learners interest in the unit, the local significance of the unit, and its value to the other units of the course.
6. The laboratory work shall be included as an integral part of problem-solving and shall, therefore, have the characteristics of experience—getting work rather than of the illustrative or confirmatory work.
7. Historical and biographical content shall be introduced when and where it would aid in the understanding of the concepts developed and of their social implications and in the attainment of the human adjustment sought.
8. Subject matter shall be so arranged that it would be a means to the solution of the problems and not an end in itself.
9. In so far as possible, the materials and activities shall be organised around the pupil's life but shall project the pupil into the problems of adult-hood.
10. The organisation shall be such that it would lead to the attainment of the immediate and ultimate objectives.

Science-textbooks should be written meticulous care and attention keeping in view the fore-going principles. Each

chapter or atleast a few of them should be tried out in actual classroom situations and then be modified, if necessary, in the light of the experiences gained. After having finished writing, the author should write an introduction to the book over-viewing the contents. It may explain the organisation of the book and give some suggestions to the teacher as regards the use of the textbook and the methodology to be practised. It is useful if a teacher's guide for the use of teachers and a workbook for the use of pupils are also prepared along with the textbook. It is beneficial if the same author/authors write out textbook in series for different classes. It will ensure the continuity of contents and treatment. Above all, a textbook in science must be high in quality, current in content and flexible in use.

Mechanical Make up and Cost

The publisher is not a mere manufacturer and distributor of books, but is a constructive worker in the field of education. Mechanical make-up of a textbook is solely governed by his attitude. 'Publish and be damn' should not form a part of his ideology. The publisher should show equal if not more concern to the artistic preparation of textbooks than the author. He should be very much cautious and alert towards the hygienic requirements of textbook-printing. The size of type, thickness of letters, space between letters, best length of line, leading between the lines, margin, colour and finish of paper in relation to legibility and eye-strain are important considerations so far as the mechanical make-up is concerned. The cover page must inspire the reader to open the book. Hence it should be arresting and expressive selecting the contents.

Cost of textbooks is no less important a consideration in a poor and developing country like ours. The basic question here is of winning over the children to education. Cost of textbooks and stationery must not come in the way of education of the boys and girls in a welfare state. In view of the poverty of the parents in our country, cost of books should be

lowered as much as possible. Nationalised textbooks can set an example in this direction.

Discussing the non-egalitarian force in our education, Dr. Shah (1969) observes that elementary school students are required to spend somewhere between Rs. 12 to Rs. 17 annually on books and stationery. He further analyses that "... the inability of poor families to spend reasonable amount on books and stationery is the important factor in explaining the stagnation at the elementary stage leading to premature withdrawal from school, the rate of stagnation of 59.1 per cent for poor students going to Municipal school (i.e. the students of the age group 6-14, who are not found in the corresponding class or grade of elementary education) as against that of 32 per cent for rich students ... is quite significant."

Textbooks and Transfer of Learning

Formal education has always been based on the assumption that the individual will apply what he has learned in school to situations and problems he encounters in daily living. Therefore, transfer of learning, in its broader sense, is basic to the whole notion of schooling. Without our reliance on transfer teaching would be hopelessly specific. Mursell (1952) has asserted that if transfer cannot be made from one situation to another it is because real learning in terms of understanding has not taken place.

The authors of science-textbooks should note that our object in teaching science is to develop a disposition in the boys and girls to use the knowledge and methods of science in life-situations and to enable them to be creative and critical not only in the laboratory or classroom but also in all walks of life—home, office, factory or farm.

"What is to be transferred" says Dr. (Mrs.) P.P. Singh "can be a fact, a method, a general principle, an attitude, or a way of life. The author must highlight the element to be transferred and bring it into focus so that the reader becomes clearly aware of it. A variety of examples may then be given to develop the concepts. Practice for application of the generalisation may be suggested in the lesson or in the exercises

which follow the lesson. More suggestions should be given to the teacher in the teacher's hand-book, if there is one to accompany the textbook, to develop generalisations while teaching."

Textbook and Creativity

A major charge levelled against textbooks is that they are conservative, authoritative and blocks creativity. The author of science textbooks should take cognizance of this criticism and try to make the science textbooks free of this conservative and authoritative influence. In this connection Ernest Milton's remark is worth recording: "A good textbook should be authoritative, in one sense. Its presentation of subject matter should be reliable, accurate and true to scholarship. But the textbook if it is well written and carefully edited can invite creative response. It can be a guide to discovery. Moreover, the textbook's influence is modified by how the teacher uses it and by the opportunity the school creates for experiences to supplement it."

There is a necessity of drawing useful implications from the field of creativity—research for preparing standard and quality textbooks, teacher's guides and work-books or idea-books. Dr. Torrance (1964) is quite sure of the benefits which can be accrued from such implications. He is of the opinion that we should put a large share of our creative energy into inventing ways of making books more effective for evoking creative behaviour. He is convinced that we can build into textbooks at all levels of education much of what we have learned from research about creative process, the creative thinking abilities, the creative personality, and conditions favourable to creative growth. Dr. Torrance experimented with this in one textbook in his own teaching field, *Personality and Mental health*. He employed many techniques to involve the reader and his experiences. The language he chose was self-involving. He tried to heighten anticipation, gave the reader opportunities to rearrange and reorganise information for various purposes. Instead of the usual dull, repetitions summaries, he gave the reader opportunity to synthesize the knowledge contained in a

chapter for the purpose of solving problems. The Indian authors can also undertake such bold experiment of writing a textbook of science.

What is important and essential from creativity point of view is that the exercises should provoke readers to think of multiple possibilities and ways of tackling a problem. The readers should be encouraged to associate different ideas, meanings and concepts to find out a solution or to arrive at certain conclusion. The children are also be enabled to elaborate and transform the learned material and to go beyond what they have read in their books. One study of the thinking abilities of delinquent girls (Will 1964) reveals their outstanding thinking characteristics to be their serious inability to elaborate. Furthermore reading specialists—Durrell and Chambers (1958) have concluded from their research that exercises in elaboration are extremely promising in the development of good readers.

Lourie (1961), Mc-Goldric (1961) and Torrance (1964) are of the view that the textbooks can be a very good starting medium for teaching research concepts and skills. Our educational system has been delaying research experiences and requirements longer and longer. Jablonski at the University of Pittsburgh indicated that there is a great readiness among high school and elementary school students for research. In the light of the lives of those scientists who have become eminent as creative achievers this is not surprising. Many of them began early to develop research concepts and skills. The students should be afforded an opportunity to "look over the shoulder" of the scientists. This can be done, as J.B. Conant puts it, through a series of case studies which permit students to look in on selected critical developments of science when that subject was in formative era. Such approach will develop in the students 'the tactics and strategy of science'.

"It has been my contention" says Dr. Torrance "that children can be taught these powerful concepts early in their educational careers and that these concepts then become tools in their thinking and learning throughout their lives. They then become "over learned" along with other skills and

concepts taught at this time, whereas desirable habits and attitudes of research may never be mastered if postponed too long." This 'initial momentum' for research is a must in a science-sewn society, because earlier we lay emphasis on ideas, meanings and their relationship, methods of intellectual attack and research skill, the more certain we can be sure of the foundations.

To make a textbook of science as flexible as possible and at the same time to develop some of the skills of creative thinking and behaving, separate laboratory manual and idea-books might be developed. One section might be provided as an "idea trap" for the listing and development of provocative ideas, provocative questions, and the like. The remainder could be geared specifically to specific content chapter by chapter. The exercise which require the reorganisation and re-arrangement of material, the development of syntheses of materials in order to solve problems, scanning for cues for problem solution, and the like could be included.

In essence, the textbooks are not all sufficient 'self-educating series'. Textbooks can only be sign-posts pointing directions, not police directing traffic. Individual work private study, class-lessons and discussion are also very important means of instructions. For children, the best books can never be more than a claver 'robot'. The breath of life must be communicated by the teacher.

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In Defence of Textbooks

Can we really dispense with textbooks in India? Perhaps, not even in America. "Probably few countries in the Western World" notes Dr. Strickland "have permitted textbooks to hold so large a place in the total curriculum as does the United States." The day, I believe, when textbooks will be discarded or abolished is farther away than colonies on moon. In fact, we educators talk a far better game than we play. Without visualising the full implications of an innovation, we rush to print or podium, quick to handle the new-found word to add our tailing gloss to it, to give it a professional twist that will make it ours and make us stronger for having taken it. Now we pronounce DTM (detached teaching material), a firm profane or protestant term, to label tasks we promise to do better than we have done before.

Textbooks in Indian schools have come to stay because of four distinct reasons :

1. Recruitment of indifferent and inadequately prepared teachers,
2. Poverty of parents which prevents them from purchasing the books of general reading for their wards,

3. Lack of alternative effective media of instruction and snail-pace progress of instructional technology, and
4. Textbooks present psychologised content to the pupils and preserve the structure of knowledge.

The basic problem in our country is of winning over the masses to education and in a materially poor country that can be done only by minimising inconveniences of the people and reducing the cost of education, particularly of text material. Hence our first and foremost consideration should be : "Can we reduce the cost of text material by introducing DTM or any other instructional device?"

Now the question of inflated satchels. Who is responsible for this ? Textbooks or teachers, who are also authors, or administrators. I think this is no fault of textbooks. In this time of change, speed and information-explosion we must follow the principle of elimination and emphasis in preparing text material. We must get rid of the junk and lumber present in the textbooks of all levels. We want books to put a cutting edge upon ideas dulled by disuse. The administrators and teachers, by investing a little more effort in planning school time-table and activities, can certainly lighten the weight of child's school bag. It is a matter of internal planning of the school and not the problem of education.

And one question more. Is it essential to carry all the books to school every day ? Does it not make the teacher idle and dependent ? If at all the sight of children carrying weighty bags has become almost unbearable for us, let us think of an alternative arrangement. The books can be kept in the school and given to students when they come to school. This will increase the durability of the books and initiative and independence of the children. Furthermore, a textbook is just a part of the whole instructional dialogue. It is an 'assistant teacher', not the 'Master teacher'. Its influence and authority can be modified by making its judicious use by the teacher. And finally, the DTM enthusiasts should attend to one more question : Is our present stock of teachers, who adhere rigidly to textbooks, quite efficient and capable to handle DTM successfully ?

Let us now turn to the question of programmed textbooks. Having reviewed the researches done in this field, Ernest Hilton, of Harcourt Brace, has noted a decline of interest in programmed instruction in the United States. Programming has its own limitations. Every item of the syllabus can be textbooked, but cannot be programmed. Besides, the presentation of subject matter in programmed format requires space, a matter of some practical importance and financial implications.

S.L. Pressey (1963), a prolific writer and researcher in the field of programmed learning and machine teaching, has quite emphatically pointed out that "the programmed book is almost impossible and the teaching machine roll entirely so. Mostly, even for the first go through, they are unsatisfactory, because the most important matter to be learned has structure, which the programming destroys except the serial order, and most important learning is integrative and judgmental, so requires a looking about in what is being studied; seems about as hampering as a scanning device which required that one look at a picture only one square inch at a time, in a set order . . ."

A programmed textbook does not teach the basic skills of reading as they are needed in modern education and modern life. Reading is highly dynamic activity. Its speed and efficiency depend not only on print size and legibility, but also upon the orderly arrangement of words, sentences and paragraphs on consecutive pages. Linear programmes would be of little or no help in teaching readers how to grasp the meaning of printed verbal material at high speeds.

Textbooks is a topic that is at once new and old. But there has been an unnecessary taboo on textbooks. It has been a source of dissatisfaction and a subject of controversy. Strangely enough, it has survived all the odds since 1650 when Comenius produced his first illustrated textbook: 'Orbis Pictus'. In fact the vociferous and vitriolic attacks on textbooks have prevented educational scholars from attending to the text problem. On account of an almost total absence of research on ubiquitous text, today we have no comprehensive modern view of what texts should try to do? What limitations they have, and how they might contribute more in the school communication?

Surely, now problem of the textbooks need sober attention.

In spite of the rapid developments of other forms of communication, civilization is more dependent on the printed word than ever before. Lee J. Cronbach has rightly remarked that "the classroom teacher has heard the attacks on the text, but even so he has refused to discard it, because his daily experience shows him that the text is useful. Teachers have not had sufficient confidence in the substitutes offered for the text to abandon their old standby." For these reasons, the issue of whether or not textbooks should be used is probably a false issue. To dispense with the textbooks, then is nothing short of folly. And to continue arguments against its use in an educational fallacy. Distracted by this dispute, however, educational leaders have failed to grip the real problem, namely, to find specific ways of improving text material. Education Commission (1964-66) too have listed lack of research-interest in this area as one of the predominant factors responsible for the proliferation of low quality and substandard textbooks.

Evolution of Textbooks

The most primitive men relied almost entirely on face-to-face communication to transmit knowledge and skills from one generation to the next. The pattern has shifted gradually to greater dependence on remote communication techniques. The first man who draw pictures in caves or marked their tools with symbolic patterns started the trend towards the use of stored information to structure human learning (Smith and Smith, 1966).

Since the earliest times the Vedic learning was transmitted orally in India from one generation to another. The art of writing was probably unknown in the Vedic period (from prehistoric times to C. 1000 B.C.). Hymns, therefore, had to be studied from the lips of the teacher and not from the pages of books. The art of writing was certainly well known in Indian by C. 800 B.C. But, its services could not be much utilized in the cause of education owing to the absence of paper and printing. Books were written on birch leaves and were very fragile. They were beyond the means of the average teacher or student (Altekar, 1955). The Portuguese established the first printing press in Goa about the year 1556 and soon after published a few works of religious nature. The first printing press was instituted in Madras in 1711 and a Tamil

version of the New Testament was published. In 1817 the Calcutta School Book Society was formed for the preparation, publication and cheap or gratuitous supply of works useful in schools and seminars of learning.

The indigenous schools, it would be recalled, used no printed books at all. The new system of education (1854-1902) did very valuable service in preparing textbooks, printing and publishing them and popularizing their use in all schools. This reform, in spite of its undisputed advantages, met with some resistance in the early years; but by 1900 the use of printed books had been universalized in all primary schools (Nusrullah and Naik, 1962).

Books as we know them are not over seven or eight hundred years old. Written books were not produced in northern Europe to any significant extent until seventh and eighth centuries, when monastic scribes began to reproduce in their finest scripts, the ancient and comparatively crude manuscripts that they possessed.

The first books were clay, wood and stone tablets such as the Cuneiform tablet. The Egyptian established a literature of a sort and professional scientific works written in scroll book form. Other types of books were developed in ancient times in other parts of the world. The Chinese bound sheaves of bamboo stripes by perforating them at one end and stringing them on cords or thongs, and the Indian bound palm leaves into books. Recently discovered Hebrew religious tracts, long hidden in caves on the edge of the Judean desert give us a clear idea of the nature of scroll books just prior to the Christian era. The Greek and Romans collected sheaves of parchment and tied them into books. Both scroll and bound tablets types of books were found in the excavated ruins of Pompeii.

Although the invention of printing with movable types is attributed popularly to the German Gutenberg, he by no means was the first to use the process. In Europe, the Dutchman Cosler is said to have introduced typography some years before Gutenberg, but the process was developed in China. In 1390, the king of Korea ordered bronze type cast in a foundry, and books were printed in Korea from the metal type in the early

years of the fifteenth century. Before that tin and wooden types were used for printing in China. Thus, all the basic processes of typographical printing were developed in China and Korea.

It was probably more than a coincidence that the first really efficient written language developed concurrently in Egypt with the development of the first good writing material—paper. In the western world, parchment and papyrus were used throughout most of the Middle Ages, although a far cheaper and more efficient material had been invented in China early in the Christian era. In 105 A.D. a method similar to the modern method of manufacturing paper was reported to the Chinese emperor. The Chinese method of manufacturing paper was taught to Arabians at Samarkand by Chinese captives in 751. This displaced papyrus even in the country of its origin, Egypt, by about the end of the tenth century. Although Arabian papers were imported into Europe from the Middle East, the secret of manufacture travelled to Europe indirectly, from Egypt to Morocco and thence to Spain, where the Arabs were manufacturing paper in the twelfth century. The first recorded paper mill in Christian Europe was set-up in 1189 at Herault, France.

The European development of printing with movable types in the 15th Century revolutionized not only the act of bookmaking but the entire eastern culture. The Phoenicians and Greeks invented alphabetic writing, but the Europeans mechanized it. The Chinese invented a printing process many centuries ago, and even printed from movable types more than three centuries before this process was used in Europe, but it did not have the same impact in China that it was to have on the Western world. The apparent explanation is that the many characters in Chinese writing make typewriting far more difficult than an alphabet of twenty-six or so letters.

The first steps towards standardization of writing form were provided in the Middle Ages by developing art of bookmaking and by the compilation of dictionaries by the Arabs in Spain. The Arab culture in Spain around the ninth and tenth centuries constituted a spur to European education not only

because of their dictionaries but because of their general interest in books and schools at all levels.¹

After the invention of printing, the Latin Vulgate Bible, based on some of the oldest available manuscripts, quickly became the most important and widely printed book. As the first generally available book the Bible assumed an importance for education far beyond its religious significance and later was translated into the various spoken languages of Europe. It was used as the basis of most of the teaching in some of the newly established schools, and, for a person taught at home by parents or tutors, may have represented the only textbook.

By the sixteenth century, there began to appear in Europe printed books prepared specially for general educational purposes, including scientific and technical works. Leonardo da Vinci's works were as influential scientifically and technically as they were artistically. He lived during later part of 15th century and early part of 16th century. Leonardo's manuscripts were lavishly illustrated by his own hand and written left-handed in a mirror script. Comenius (1592-1670) was perhaps the first man to write an illustrated textbook, "*Orbis pictus*" for the children. Pestalozzi (1746-1827) wrote a number of textbooks for his use in his school, but he was not specially successful in his formulations. Where Comenius was at his best Pestalozzi was at his worst. His books were rather uninteresting, crammed with details and numerous digression, and generally unsuited to either the children or the methodology (Cole, 1962). One of the first printed books to achieve eminence as a scientific text was *DE Re Metallica*, written by George Agricola and printed in Latin in 1556. The first Arithmetic and Algebra books written specifically for teaching the young were prepared by the teachers of the early Latin schools of Pudia and Venica. (Smith *et al.*, 1966).

In India, the Union Ministry of Education has been taking a keen interest in this area. In May 1954, the Central Bureau of Textbook Research was set up to conduct research and provide leadership in the field of textbooks. The Bureau studied the selection, production and distribution procedures in the states and brought out a number of publications. The Bureau was later merged into the National Council of

Educational Research and Training and was renamed as the Department of Curriculum, Methods and Textbooks. This Department undertook the work of preparing specimen textbooks. In addition, the Council appointed study groups and panels for writing textbooks in different subjects. The Council has also set up its own Department of Textbooks in the year 1969 which acts as an academic secretariate of the National Board of School Textbooks. A National Centre of Textual Material has also been instituted.

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Text-books and their Improvement

No bibliography of protest defy incorporation here to defend the legitimacy and conduciveness of text-books as an instructional material. The text-books are the most widely used of all teaching tools. Due to their dominance and popularity, they have become almost synonymous with schooling. Except the lively influence of a human personality, the text-books serve almost all the instructional purposes.

A text-book is 'a-teacher-in-print' and sometimes even superior to the average teacher. A good text-book is an asset to the teacher. It conserves and preserves his time and energy which can be profitably employed for better study and preparation of teaching aids. This will result in better administration of the already prepared instructional material. Looking to the acute shortage of good teachers, Prof. D.S. Kothari has pertinently pointed out that "out of the three elements—good students, good teachers and good text-books—the text-books are the most important. Because, with a good text-book at least good students have a chance to learn, as it is impossible to get good teachers for all. After all the number of good teachers in any country is always limited. Most of the teachers are of average ability and this makes good text-books extremely important."

It is really distressing to note that the condition of text-books in our country is deplorable. Their standard is deteriorating and they are falling short of their ideals. Commissions, conferences and recent educational reports have equally and equivocally accentuated of the clamant demand of improving text-books. It will not be out of place to recall the observations of the Secondary Education Commission (1952-53) in this respect. The Commission have observed that "Most of the books submitted and prescribed are poor specimens in every way—the paper is usually bad, the printing is unsatisfactory, the illustrations are poor and there are numerous printing mistakes." Hence, there is a dire need of effecting improvement in the standard and quality of text-books.

Nationalization of Text-Books

In our country, production of text-books is in the hands of private publishers. They are guided by the exorbitant profit motive. Most of the publishers are of 'get-rich-quick' type. They don't bother for the quality or standard of the text-books. 'Publish and be damn', is their adored ideology. As text-book production is a lucrative business, several book-sellers even without adequate resources and appropriate knowledge of the techniques of the text-book production, are entering in this trade. They generally publish third rate books with cheap material and cheap authors. They also stand too low to get their books prescribed.

Sufficient trial has been given to the production of text-books, through private enterprise, in our country. But, no improvement could be seen in this field. Moreover the quality of text-books is going from bad to worse day by day. As a remedy it is suggested that the Government should take the responsibility of getting the text-books written; published and distributed. In other words it can be said that the text-books should be nationalized. But, this again raises several questions and poses numerous problems in view of the multifarious activities of the Government and the red-tape prevalent therein.

Though, the nationalization of text-books is a controversial issue, yet the Government and a great number of people view

it as a sovereign solution of all the problems and maladies involved in text-book production and distribution. It is contended that through nationalization of text-books their prices will be lowered, quality will be improved and the evils of selection will be eliminated. Contrary to this view there are apprehensions in some quarters that nationalization of text-books might result into monopoly of publication, thought-control and regimentation of mind. In the year 1964, Mr. M.R. Masani in his speech in the Lok Sabha eloquently exposed that "the Governmental monopoly of publication of text-books had resulted in poor quality, high prices and promoted the sale of spurious and text-books causing losses to some States". Similarly, Mr. H.V. Kamath also expressed that nationalization of text-books might lead to 'thought-control'. A report of the regional seminar of Headmasters, Headmistresses and Education officers held at Patiala in the year 1956 also maintained that "Nationalization may kill the originality and initiative" in the sphere of text-book production.

In the light of the criticism levelled against nationalization of text-books we are likely to say that, if the Government has, once for all, decided to nationalize text-books, it must set an example before the other non-totalitarian states of the world, which have not yet undertook nationalization of text-books. Besides, its bureaucratic set-up and red-tape it should not give an opportunity to the private publishers to combine to see that the Government has failed in its undertaking. The fear of indoctrination by the party in power, can be eliminated by proclaiming such step illegal and unconstitutional. Originality and initiative can also be restored by impartially encouraging healthy competition among the authors and by giving them adequate remuneration in the form of royalties.

Nationalization of text-books can be carried out successfully provided the Government establishes its own printery with all the modern binding and photogravure machinery under the supervision of trained personnel equipped with the knowledge and techniques of text-book production. In addition to this, procurement of an adequate stock of paper for printing and binding is also an urgent requirement.

On the other hand, if the Government wish the private publishers to carry on the production of text-books, certain checks and restrictions are to be imposed on them. Firstly, the publishers who want to produce text-books, must get themselves registered. Registration should only be done after ascertaining that they possess adequate resources and qualified staff for producing text-books. Apart from the skilled printers, binders and block makers, the publisher must employ a team of editors for different subjects and languages under a senior editor, who acts as a guide and coordinator. Whenever a text-book is submitted before the 'State selection committee' or Board for selection, the committee should ask the publishers to produce a certificate from a Government school where the book has been tried out. Untried books should never be prescribed.

The publishers have also their own difficulties and limitations. The Government should extend a hand of help to the private publishers to encourage the text-book-production industry in the country. There is a nonavailability of the standard quality of paper. The Indian publishers can't use the foreign glazed art paper, except in special cases for an art book, due to certain import impositions. Excepting few, the publishers cannot import costly printing, binding and paper producing machines. Therefore, the Government should extend aids to the ambitious publishers from the 'State Finance Corporation' or 'National Small Scale Industries Corporation' without much complications.

In order to make-up the dearth of trained and skilled hands 'text-book production' may be introduced as a teaching subject in the higher secondary Schools, Junior technicals and Polytechnics. Separate training institutions may also be started at chief production centres like Delhi, Calcutta and Bombay. In each centre there should be separate departments for training in editing, composing, printing, binding, block making and other allied subjects.

Production of Text-Books

Text-books are the symbols of national culture. They reveal our national ideas, ideals and values. In fact, "they are an

influence towards national unity through the establishment of a common culture". Hence, the democratic and secular image of our nation must be reflected in the mirror of text-books.

"The content of the text-books" says Francis Shoemaker "Speaks explicitly of the urgency a nation feels for dissemination of new and significant information. The organisation and presentation of subject matter in text-books symbolize philosophy of education prevalent in a nation. The process of publication and distribution symbolize both the economic and political characteristics of a culture. And the selection, status and qualification of authors symbolize the spread and acceptance of professional responsibility." Thus, the text-books are the true reflectors of our total national culture. Hence, they should be prepared with meticulous care and attention.

Text-books are the means of supplying indirect experience in large and well organised amounts. A good text-book, is a compact preparation, a sequential story of accepted instructional materials. No doubt, such a preparation is systematic and based upon the latest information in the area of teaching the subject. Nevertheless, it integrates the efforts of educational psychology, philosophy and practical teaching experiences.

From the production point of view, a [text-book can be divided into internal and external aspects. The internal aspect includes the Authorship, Subject matter, Learning exercises and Illustrations; while external aspect includes Mechanical make-up and Cost.

Following are the suggestions for effecting improvement in the text-books as regards—Authorship, Mechanical make-up and Cost, Subject matter and its Organisation, Method of presentation, Form of presentation, Teaching and Learning aids together with Supplementary reading material.

1. *Authorship*

A text-book in a subject may rank very high in authorship, if long experience in the field of teaching the subject be combined with the years of scientific investigation. A trained graduate with some journalistic and teaching experience may

become the author of Middle, Matric or Higher Secondary books with advantage. In my opinion, a panel of authors can produce an improved product. Experienced professors of the universities and training colleges, school teachers and text-book specialists may be associated in the task. The layout and the designing of illustrations should be entrusted to artists with a specialized knowledge and proficiency in drawing illustrations for children. The authors and the artist, should work in close collaboration.

Before starting to write a text-book, the authors should clearly define their goals and objectives. The authors should be conscious of the fact that a text-book is not an end in itself but an effective instrument for the realization of certain aims and objectives related to the demands of the subject in particular and the educational needs of children in general. In their keenness to cover the prescribed syllabus and the narration of facts in its rigidly logical sequence, they should not be oblivious of the disciplinary and cultural values underlying the study of the subject. Prior to the submission of the manuscript for printing the cyclostyled chapters must be tried-out and tested in the schools. It is beneficial if the same authors write text-book in series. It will ensure the continuity of content and treatment.

2. *Mechanical Make-up and Cost*

(a) *Page-Size* : For promoting effective learning and quick understanding, it is desirable that the pages of the text-book for lower classes should be longer in size (19 cm. \times 12.5 cm. or 21 cm. \times 14 cm.). Because it will admit of bigger illustrations and of the use of large type-face and leading between the lines. The size of the page may gradually be reduced as we go on to the higher classes. Similarly the type size may decrease with the rise in class.

(b) *Binding* : It is suggested that the cover page of the books should be arresting and expressive reflecting the contents. Preferably the binding of the books should be wire-saddle-stitched. When the number of pages exceeds seventy or eighty, the books should be sewn in sections. The end-papers should

be pasted down with the cover. The covers should be stiff and durable to avoid wear and tear. Board-covers are most suited to this purpose. If not, instead of book-paper or heavy paper linsim, fabrollen, muskin or linline may be used in providing book covers.

(c) *Paper* : The print shows through the cheap and bad quality paper. It gives a blurred impression which retards reading. Such books tend to mar the enthusiasm of the students for study. For improving the quality of text books, it is very essential that the quality of paper should be good. White-opaque paper or off-white opaque paper is quite suitable for the purpose.

(d) *Cost* : The question of cost is nonetheless important. Undoubtedly good text-books cost more. But, in view of the poverty of the parent class in our country, it should be lowered as much as possible. Nationalized text-books can set an example in this direction.

3. *Subject matter and its Organisation*

The content and its organisation should be in harmony with the needs, interests, age, ability and aptitudes of pupils for whom the book is meant. Unit-planning is the best form of organisation to care for the individual differences.

The prescribed syllabus should act as a guide to the authors. Yet, in no case, should they be its slaves. They should display imagination and resourcefulness in the selection and development of significant aspects of topics included in the syllabus.

The subject matter in science-text-books should not be unduly factual. Adequate attention should be paid to the development and inculcation of basic concepts, essential skills and desirable attitudes. For this, pupils should be stimulated to observe; to record and to draw conclusions of their own. The content should provide the pupils an intelligent understanding of their immediate environment and full awareness of their surroundings.

Presentation: The author should adopt a unified and integrated approach while dealing with the subject matter. The contents should be naturally woven round the centre of interests of the children of the particular age-group. The details of the content should be first linked with the living experiences of children and then expanded gradually from the near and known to remote and unknown.

The style of presentation should motivate and interest the pupils. It should satisfy their growing curiosity. Narration should be lucid, vivid and explanatory. The treatment should be more psychological and less logical.

4. *Illustrations*

Their place in the design of the text-page is next in importance to the text-materials. There should be an adequate number of illustrations. At least one-third of the text-book should be devoted to illustrations of varied forms. Each part of the illustration should be properly named. Illustrations in text-books for lower secondary classes should be of a larger size, preferably half of a page. The size of an illustration may, however, decrease in books for higher classes.

Illustrations should not only be coloured and attractive but they should be accurate and distinct also. They should be properly placed and should reinforce the instructional effect to give reality and vitality to the text. They should be in close vicinity to the text, where they are referred to. General flush-type illustrations should be used. This type of illustrations are without conventional borders and are popular in America. Thus, illustrations should explain, supplement and decorate the text.

5. *Exercises*

Exercises should primarily aim at realizing the objectives of teaching the subject. They should be varied and adequate in number. More stress should be laid on application and on encouraging thinking by the students. For this purpose, recall, recognize, reason, matching, discriminate and multiple choice

types are quite suitable. All exercises should not be of objective-type. Some provision should also be made for the easy type exercises. To give expression to the 'manipulatory instinct' of the pupils, exercises in making of charts, maps, models and collections of specimen are to be included. Besides, the questions seeking to develop attitudes, activity-exercises regarding individual and group work of various types, study of locality, visits to places of interest, field trips and excursions, surveys and dramatization should also be emphasised.

6. *Language*

The language should be simple and clear. Facts should be stated in a simple language. It should be to the point and not clumsy. The aim of the author should be to convey the meaning clearly and make the subject matter easily intelligible to the students. As far as possible, the use of abstract words should be avoided. To convey the meaning clearly, sometimes personal words may be used, but they should be treated as means to understand the technical or difficult words. They should not take the place of a technical word. The sentences used in the text-books should be short, crisp and specific in form and effect. The length may increase, relevantly, with the rise in class level. It is useful, if the footnotes providing the meaning and pronunciation of technical English equivalents are given in the text-books.

7. *Supplementary Material*

A good text-book should contain a preface or an introduction over-viewing the contents, an index and a glossary. In a text-book of science short biographical sketches of eminent scientists and accounts of the history of specific scientific developments should also be given. In a text-book of language the biography of poets and authors, and short account of the history of literature can be included as supplementary material. Suggestion for class teaching and suggestions for further study may also be given.

The text-books should be prescribed ordinarily for a

specific period, at the most for 3 to 5 years. The text-books should be reviewed periodically by competent reviewers. The books should not be changed frequently before the expiry of the fixed period. After the completion of the period the text-books must be revised and made up-to-date by the authors concerned.

The text-books are not all sufficient 'self-educating-series'. Individual work, private study, demonstrations, lessons, oral instructions and class-discussions are also very important means of instruction. For children, the best books can never be more than a claver Robot. The breath of life must be communicated by the teacher.

Textbook Authorship : A Research Perspective

A textbook is a social institution having a long history and complex ties with other social institutions. Emphasizing the important role the textbooks have to play in national integration, social awakening and economic growth Dr. V.K.R.V. Rao (1970), in his address to the second meeting of the National Board of school Textbooks, observed that the programme of improving textbooks is an issue of much deeper and wider improvement.

The need to improve school and college textbooks is a perennial subject—every where and with good reason, for it points to a job that can end only when textbooks are dispensed with. In India the *Education Commission Report* (1964-66) makes textbooks a topic of current interest and a theme for editorials that use such words as 'shoddy' and 'shameful' (Tibbetts, 1967). As a matter of fact, the entire textbook situation in the country is very alarming because the quality and standard of textbooks produced leave much to be desired (Chandrakant, 1966).

Seemingly any nation which recognizes the key which textbooks hold to national development, would turn its energies first and seriously to preparation of qualified, responsible textbook personnel—the writers, editors and graphic artists, who

can bring their diverse capabilities and originalities to bear on textbook production problem and the training of additional personnel (Shoemaker, 1962).

Textbook writing is a highly technical and responsible undertaking. Comenius (1592-1670) called it '*spinosa didactica*' (thorny path of educational writing). Textbooks are given character by the author's conception of the purpose and nature of education and by the completeness of their understanding of the process of learning (Richey, 1931). Nevertheless, they are the product of the study and thinking of specialists who are qualified by research and experience to write in their field.

The competence needed for authorship led Mc-Cullough (1965) to remark : "the task requires almost super-human abilities. One must consider the expert knowledge of many fields—what would a sociologist say about the kinds of material to be used ? What would the psychologist say about the methods and the contents ? What would the linguist say about varieties of language used and methods employed ? What would the reading specialist say ? What would the oculist say about the size of type, the spacing, the illustration, from the standpoint of legibility and reader fatigue ? What would the literature specialist say about the content ? What would the artist say about the art education being given through illustration ? What would the evaluation expert say about the way skills are tested and used ? What would the economist say about the impressions given about various occupations, agriculture, business, government and industry ? What would the village parent say about the stories used; the city parents ?"

Undoubtedly, authorship is the most important and challenging aspect of textbook production. The authors are the focal points through which the culture 'flows' in its passage from one generation to the next (Bierstedt, 1955). Who, then, are the authors of texts ? What are their academic achievements ? What is their social status ? What aspects of a culture do they represent ? What distinguished people who write textbooks from those who do not ? What are their ideologies ? What are the factors which influence the initial decisions to write a

textbook and the manifold judgements involved in the selection of materials to be presented? These and several other questions warrant answers through research. A fine socio-economic and pedagogical understanding is required of those who write and those who publish textbooks.

Given the general agreement on the importance of textbooks, it is surprising that there has been so little research on textbook authors (Hilton, 1969). Richey (1931) studied the authors of textbooks published between 1876 and 1926 in Geometry, Arithmetic, Spelling, American History and Reading. Bierstedt (1955), without any evidence of research, simply discussed various sociological factors which exert their influence on the authors of textbooks. He believes that textbooks writers belong to the middle social class and hence they transmit middle class mores and ideologies. Nolen and Goetz (1959) are of the view that textbooks are almost never planned and written entirely by one person. Chaudhari (1970) also maintains that a panel of authors can produce a better book.

A study by Brownson and Schwab (1963) compared authorship of science textbook published in 1955 with those published in 1915 and showed, in general, that the scholarly standing of 1955 authors was lower than that of 1915 authors. Lynch Evans (1963) compiled information on authors and editors (who put together literary anthology) of high school English textbooks. They found, in every instance, more than a single author; rather authorship was by a team. Most team included both high school and college level teachers. Jovanovich (1964) in his book on publishing also discussed textbook writers and writing.

The sociology of authorship is not yet noted for the proliferation of its studies (Laurenson, 1969). However, a few studies have been reported in the area of sociology of literature. Altick (1962) studied the social background of 968 men and 244 women writers over a period of 1800-1935. Williams (1961) noted the decline of upper-class writers after 1800. Laurenson (1969) studied 170 writers of Great Britain—who born or died between 1860 and 1910. But, there is almost an absence of such studies in the field of sociology of textbook

literature. Bierstedt's (1955) discussion remains the most comprehensive, but he wrote, necessarily, without information based on research.

Textbooks like other books, are instruments for preserving cultural continuities, but they also have something to do with the process of cultural change. The manner in which textbooks serve these purposes, while known in superficial outline, has not so far been subjected to systematic analysis and research. The sociology of literature, including textbook literature, is still in an inchoate stage. There is hardly any reason to regard textbook writing as an occupation. Each author is identified with something other than a writer of textbooks. Most of our writers are not full time authors. For most authors, however, the elements of prestige, organization-strength and financial backing are absent. The monetary incentives to authorship are notoriously poor all over the world. As long as the authors are content to be scribes working under the orders of an uninformed publisher or a faceless bureaucrat, the future of the books cannot be very different from their recent past. Who are they, then and how and why do they write textbooks? These questions need to be answered through research. "The future of the book will be assured," says Alberto Moravia, "only if we succeed in writing books; it will perish if we content ourselves with merely printing them."

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Values in Textbooks

There is a great deal of concern today with the problem of values. The most vital aspect of the structural stability of any society is the values by which it lives. These values evolve and change slowly but constitute, at any given time, a bedrock foundation for an educational programme. It is a truism to say that the values of any culture automatically frame the values of educational system that exists to serve the culture. However, any educational enterprise endowed with inherent power achieves the full realization of that power only to the extent it translates cultural values into a meaningful educational totality of many parts, and into a meaningful curriculum as the most important part.

Kneller (1965) observes that a culture's values are its ideals of what is worth striving for. In Inlow's (1972) view values are the determiners in man that influence his choice in life and that thus decide his behaviour. In brief, values are not the concrete goals of action, but rather the criteria by which goals are chosen.

Textbooks may be looked upon as symbols of national culture and they are perhaps more revealing of national ideals and values, than any thing else. If the 'liberal-democratic' framework on the one hand and the 'scientific technological'

framework on the other are to serve as two major sources of values in the larger social system of India, then the educational system itself must reflect these values in practice and procedure. If we accept the goal of rational, secular democratic society based on modern technology then rationalism, secularism and equality must find a place in the substantive ideas communicated in the process of education. Minimally, these ideas must find expression and support in textbooks and other supplementary reading material (Gore *et al.*, 1970).

How far do these democratic and modern values find place in the text material is a question which needs study and research. In fact, this aspect of textbooks has not attracted the attention of educational researchers. However, very few studies have been reported in this field.

Narration and description, as value transmitters, have important limitations. While they transmit values, they transmit them in more disguised form than does the directive or the ethical system. Hence, there is special danger that narrative may communicate selective value without the communicator or the teacher realizing this fact. Unless the teacher counteracts the influence embedded in the text, it may reinforce in pupils some values which the school does not consciously wish to indoctrinate.

One example of the type of research that might disclose such unintended biases is provided in a preliminary study of children's readers by a group of psychologists at Yale University (Child, Potter and Levine, 1946). They tabulated the implied values and expectations built into 914 simple narrations. These reading texts teach the child that 'effort' and 'learning' are rewarded. The books, however, do not encourage intellectual curiosity. Characters are rewarded for asking adults for information but are punished when they try to figure out answers for themselves. In general, the books encourage children in dependence rather than independence, tell them how to win success but not how to take failure in stride; and provide models for achievement in boys while establishing a stereotype of the girls as kind but unambitious and uncreative. In view of the preliminary character of this research, it is not appropriate to recite more of its evidence as to ways

in which narratives are presenting unrealistic values. The study makes clear what criticism of narrative materials the writer should make if the book is to be used in schools, and suggests a type of analysis which could profitably be extended to many other texts.

A study of 19th Century textbooks of America by Elson (1964) points out that early textbooks sought to inculcate traditional values (industry, thrift etc.). Some critics of modern life and education seem to favour a return to such textbooks as model.

Dhand (1967) made a value analysis of Social Studies textbooks (Class VII & VIII) of Saskatchewan province (Canada) to study the trends with respect to value orientation over the period of sixty years (from 1905 to 1965). This study reveals that none of the textbooks analysed shows a balanced orientation of textual material with regard to all of the eight social values chosen for study. The trend study in value orientation of textbooks indicates that there is a greater emphasis on the values of 'power' and 'wealth' than on any other value. Affection skill and rectitude are almost neglected.

Ehsanul Haq (1973) conducted a study to see the relationship between the modern political values as enshrined in Indian constitution and those incorporated into the content of school textbooks. In this study content analysis of Hindi, English, History and Civics textbooks of schools of Delhi was done. Findings of this study reveal that there is neither any pattern nor consistency in the presentation of values in the textbooks. There is an absence of relationship between the nature of value to be internalized and the mental maturity of the students. No uniformity has been maintained even within a class where students are generally of the same age group and mental level. The language books for the lower classes may be of more use for inculcating political values in students but the books for classes IX, X and XI are written entirely from literary point of view. There is, therefore, no emphasis in them on any one of the values of political modernization. Even in civics, which is supposed to promote, political values, no conscious and consistent effort has been made in that direction. And

there is no gradual increase in emphasis given to various political values in various subjects from classes I through XI in accordance with the principle of mental maturity.

Chaudhari and Sharma (1974) made a comparative study of values reflected in Hindi textbooks classes I through VIII prepared by the National Council of Educational Research and Training (NCERT) and the Madhya Pradesh Textbook Corporation. They found that in the NCERT textbooks highest emphasis has been given to 'courage and adventure' whereas in the state corporation textbooks 'patriotism' gets the highest rank. Although there is much similarity in the overall presentation of values in the two sets of textbooks, there is weak orientation to the values of 'sacrifice', 'faith in God' and 'obedience' in the NCERT textbook. The state corporation books have weak orientation to the values of 'cooperation' and 'compassion'.

In a subsequent study of nationalized Hindi textbooks (classes I through VIII) of Madhya Pradesh Chaudhari (1976) found that 'patriotism' gets highest and 'scientific outlook' lowest emphasis in the textbooks. Comparison, industry, courage and love get higher preference in the books of classes I through IV, while love, compassion, courage and equality get higher preference in the textbooks of classes V through VIII. Equality, truthfulness, humbleness non-violence, sacrifice and liberty get moderate emphasis in the textbooks of classes I through IV, whereas cooperation, humbleness, sacrifice, secularism and international understanding get moderate importance in the books of classes V through VIII. Health, scientific outlook, secularism, justice, international understanding and simple living get the lowest emphasis in the textbook of classes I through IV. On the other hand, scientific outlook, Justice, simple living, non-violence and dutifulness get the lowest importance in the textbook of classes V through VIII. The findings suggest that there is neither any pattern nor consistency in the presentation of values in the textbooks. It appears that over-concern has been shown for inculcating the value of 'patriotism' in the students of classes I through IV.

The foregoing review of researches point out to the fact that there is neither any pattern nor consistency in the pre-

sentation of values in the textbooks. There is an absence of relationship between the nature of value to be internalized and the mental maturity of the students. The textbooks almost fail to exercise a modernizing influence on the minds of the learners. A society oriented towards democratic socialism should have a balanced orientation of values. Hence, the authors, editors and publishers should make greater efforts for the preparation of more balanced value-oriented text materials.

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Children's Literature and Its Place in Education

"Culture" says Whitehead (1962) "is the activity of thought, and receptiveness to beauty and humane feeling. Scraps of information have nothing to do with it. A merely well-informed man is a most useless bore on God's earth. What we should aim at producing is man who possess both culture and expert knowledge in some special direction". Education neither begins nor ends with acquisition of knowledge. In fact, it is a continuous quest for new ideas, new dispositions and new attitudes. Children's literature, besides being a source of delight and aid to learning, is an important medium of developing critical qualities of mind and durable qualities of character.

A child is a human being in embryo, a man to be, and we are responsible to the future for him. Everything starts in childhood. All human qualities are planted in childhood. It is, perhaps, easier to educate a person from his first steps in life than to re-educate him when he has already formed. That is why we should not look at books for children merely as entertainment literature, as nothing but play. A tremendous educational role was emphasized in his time by Leo Tolstoy, who, besides, put his words to practice by writing books for children. In Russia, America and Japan children's literature

is considered a great cultural and educational phenomenon, and creation of books for children is a matter of state importance there.

Immediate Vs. Beyond

Literature and personal reading contribute notably to the enrichment of human spirit and the moulding of human personality. Unless, the need of quality books for children is met satisfactorily, observes justice H.R. Krishnan, there is a real danger of our children's education being incomplete. Children's literature and personal reading are perhaps, the most neglected phase of Indian education today. In the small quality of indifferently produced children books, there is an overemphasis upon the mature problems of society at the expense of the personal development of boys and girls in the spiritual, aesthetic and creative aspects of life. Authors of children's books and curriculum designers, in their enthusiasm either to give greater emphasis to mundane aspects of life and society or to relate all reading to social and ethical purposes, are giving secondary importance to personal interests and delights in the books prepared for children. This 'here and now centrism' and utilitarian approach to reduce reading and expression to "tool" aspect is atrophying the vision and startling the imagination of the children and adolescents. They are being deprived of the romance of the remote and the lure of the beyond, which brings joy, enrichment and added range of experience into the child's life.

Woodberry (1922) cites a critic saying that "literature is not an object of study, but a mode of pleasure ; it is not a thing to be known, but to be lived." Children have a right to enjoy together and individually books which appeal to their imagination, offer them adventure, tickle their sense of humour, or give them opportunity to transcend the bounds of time, place and circumstance. A love of reading is one of the greatest gifts which school or home can give to children, and love of reading is achieved first of all through finding pleasure in books (Smith, 1949).

Reading : A Glass that Widens Many Horizons

Reading, says Gates (1949), is not a simple mechanical skill, nor is it a narrow scholastic tool. Properly cultivated, it is essentially a thoughtful process. To say that reading is a "though getting" process is to give it too restricted a definition. It should be developed as a complete organisation of patterns of higher mental processes. It can and should embrace all types of thinking : evaluating, judging, imagining, reasoning, and problem-solving. Indeed, it is believed that reading is one of the best media for cultivating many techniques of thinking and imagining. But, reading is not to be regarded as confined to mental activities. The dynamic and emotional processes are also involved. In whole-hearted reading activity the child does more than understand and contemplate. His emotions are stirred, his attitudes and purposes are modified. Indeed, his innermost being is involved.

Reading has many values in school and extra-school activities. The close relationship of reading ability to general school success has been pointed out frequently. One important trend in modern programmes is the conception of reading, not as an end in itself, but as a tool to be used in all curricular activities. Reading is a key that unlocks many doors, a glass that widens many horizons. Through it a child develops his mental capacities by means of the clarifications of concepts, the organization of ideas, the improvement of problem-solving abilities, and the increase in powers of critical thinking. Through reading he is stimulated to creative efforts along artistic, dramatic, or constructive lines. Altogether, he finds reading most useful in completing school tasks and in carrying out purposes relating to hobbies, recreation and community activities. Thus, reading helps children gain greater competence in solving practical problems (Russell, 1949).

Moralising and Educating through Children's Literature

In its attempt to educate children, children's literature acts like "Chekhov's prosecutor", by moralizing or telling naive sentimental fairy tales.

In the charming, lyrical short story entitled "Home", Anton Chekhov poses with characteristic straightforwardness and acerbity some essential problems of bringing up children in the family. E.P. ByKovsky, a prosecutor in a circuit court comes home one day, only to hear from the governess that his seven-year-old son Seryuzha has been caught smoking. ByKovsky argued at length with his son that smoking is bad and therefore he should not smoke. But, this direct approach had no impact on child's mind. His son had his own ideas of what is important and what is unimportant, what is good and what is bad. To gain possession of his attention, it is not enough to imitate the language of the child but one must be able to think in the way he does. The author of children's books should learn to feel, cry and laugh together with the child. One can do nothing by logic or morality.

On the insistence of his son ByKovsky told a story of a very old emperor who had an only son who used to smoke. ByKovsky finishes the story by having the emperor's son fall ill with consumption through smoking and dying, leaving his infirm and sick old father without anyone to help him, with no one to govern the Kingdom and defend the palace. Enemies came, killed the old man, and destroyed the palace. Quite unexpectedly, this naive ending made an intense impression on Seryuzha. He said in a sinking voice : "I am not going to smoke any more" (Smirnova, 1968). The lesson which can be drawn from this situation created by Chekhov is that morality and truth should never be offered in their crude form, but only with embellishment, sweetened and glided like pills. There are many deceptions and delusions in nature that serve a purpose, and perhaps children's literature is one of them.

Manifest and Latent Functions

Children's literature serves both manifest and latent functions. The manifest functions are those having to do with the enjoyment of the themes which satisfy children's needs and transmission of knowledge of a culture. Knowledge, as Bierstedt (1955) puts it, here means those parts of the culture which help the individual to choose among possible actions. Knowledge

which reduces one's dependence upon chance. Knowledge, however, comprises only a small part of a total culture. If we take the whole of a culture and subtract knowledge from it, the remainder is imposing in size and dimension. This remainder too is transmitted. And it is transmitted even in the textbooks ostensibly designed only for the transmission of knowledge. Therefore, if the manifest function of children's books is to transmit knowledge, its latent function is to transmit the myths and the mores, the traditions and the legends, folkways and the superstitions, its ideologies and values which are an integral part of the culture. In an autocratic society the latent function is encouraged to become manifest whereas in a democratic society it remains more or less latent.

Children's Literature and Creativity

Einstein was of the opinion that "imagination is more important than knowledge, for knowledge is limited". Well-written and carefully edited children's books can provide an ample opportunity for the stimulation and expansion of children's imagination and thinking. But unfortunately majority of our today's children's books lack the kind of gritty detail that slows up the reading but speeds up thinking. The author perhaps assumes that young readers like to read a finished product. Therefore, the author does the thinking and very little is left for the readers to guess, to infer, to reflect, to predict and/or to empathize with the characters.

Torrance (1966), impressed very much by the role of fantasy and fairy tales in developing creativity and imagination, cites an example of a Russian professor of applied mechanics who taught many of today's most outstanding Russian Scientists. At the end of his distinguished career in science, he was convinced that the fairy tales had been his companion in his creative scientific achievements and that the engineer who is not brought up in his childhood on fairy tales will not become a creative engineer. ChuKovsky (1963), the Russian child psychologist, argues that fantasy is the most valuable attribute of the human mind and should be nurtured diligently from earliest childhood. In reply to those who oppose imaginative

reading in favour of scientific, factual reading, he takes the following position :

"We must develop the child's imagination, or, at least, we must not inhibit its natural development. In this connection, the reading of fairy tales is very important for little children. We often meet parents these days who are against fairy tales. They do not make them available to their children, seeking to bring up sober, practical individuals. I always say to such parents that their children will never become mathematicians or inventors."

The children's books inhibit creation when they advocate "the one best way", they encourage creation when they organize past experiences so that the learner can grasp its value and limitations. Children deserve the right to participate in the thinking. They deserve the right to reason with raw, indigested ideas. Although, they are not ready to take over all the thinking functions of the writer, but they can certainly take over part of them.

Needs of the Children and Children's Literature

There is some evidence that the infant child may bring some of his needs into the world with him. These needs are in part inherited, and in part influenced by pre-natal experiences. Society and culture play a substantial part in instigating needs. It is believed that children are indoctrinated by the culture with the need for love and affection, praise and economic security among others. For the most part these needs are learned by the child. As he lives he comes to have them as needs, and then, if they are thwarted, behaviour is seriously influenced. Given a good start in life and continuing experiences of security, a person is better able to meet the frustrating situations (Raths, 1972). Here is the responsibility of the authors of children's books to recognize the tremendous importance of the needs and interests in healthy growth and development of the children and to include such themes and stories in the books and magazines which build the self-esteem of the children and satisfy their needs (Chaudhari, 1976).

Personal-social needs may be listed in many ways. Primarily

in the personal sense, most children need an understanding of health habits and the application of science to personal and public health. They also need a developing understanding of themselves, an increasing independence in carrying out their decisions and purposes, a fair balance between success and failure, and a chance to maintain self-esteem. In a more social sense, children need the affection of family and friends, acceptance or status as a member of the group, and social recognition and approval of their personality and actions. These are obviously overlapping needs which may be denied in schools where unsuitable curriculum, overstress on competition, and the teacher's own personality patterns exercise unfavourable influences. Children's literature may contribute to these personal social needs through its content, its organization and methods. Through its contents it may provide a greater understanding of self and of others by presenting fact or fiction about persons with problems similar to those of the reader or his associates. Through its organization the children's literature may provide for a gradual development of abilities which ensure success, self-respect, and good opinion of elders and peers. Through its methods the reading material may develop abilities in working with a group, such as listening carefully to the contributions of others, and abilities in working independently, as in consulting reference material. Thus, the contributions of the reading materials to social-personal needs are closely related to its function in relation to children's total adjustments.

Values and Children's Literature

There is a great deal of concern today with the problem of values. Youth, in almost every country, is deeply uncertain of its value orientation. The world culture, in all its aspects, seems increasingly scientific and relativistic. And the rigid, absolute views on values which come to us from the past appear anachronistic. Even more important, perhaps, is the fact that the modern individual is assailed from every angle by divergent and contradictory value claims (Rogers, 1971). It is, therefore, very essential to gradually initiate the children and adolescents

in to the value system of the modern Indian society through reading material.

Children's books may be looked on as symbols of national culture and they are perhaps more revealing of national ideals, ideas and values than anything else. If the 'liberal-democratic' framework on the one hand and the 'scientific-technological' framework on the other are to serve as two major source of values in the larger social system of India, then the educational system itself must reflect these values in practice and procedure. If we accept the goal of a rational, secular, democratic society based on modern technology, then rationalism, secularism and equality must find place in the substantive ideas communicated in the process of informal and formal education. Minimally, these ideas must find expression and support in the textbooks and other reading material that is given to the children and youth (Gore *et al.*, 1970).

Values have to do not only with behaviours and attitudes within the nation but with the relation of the nation to the rest of the world. Men of world experience who have also held responsible positions in government have written on national integrity, communal harmony, non-violence, arbitration of differences, and blocking of aggression. Consultations of their works such as those of Gandhi, Nehru, Radhakrishnan and Premchand in the case of India, for example, should be productive of a list of values subscribed to by these outstanding leaders and statesmen.

Values are expressed and transmitted through narration and description in the various literary forms. For example, there is a story of a man who beat his donkey unmercifully. The donkey could do nothing about this, but he could stand the punishment no longer. So he decided to dress himself up in a tiger skin and frighten his master. This he did. His master was thoroughly frightened. However, his master noticed the donkey's hooves protruding from beneath the pelt. In a rage he whisked off the disguise and gave the donkey the beating of his life (McCullough, 1965).

Now, one may include such a story in children's books, saying that it expressed the value that one should not be deceitful, whatever the provocation. Unfortunately, however,

the story indirectly condones cruelty to animals. Should children grow up to think it is all right to torture the animals who bear their burdens and give them sustenance? Many favourite old stories in this manner condone cruelty, killing, cunningness and theft, as means to desirable ends. Similarly, some of the old stories portray polygamy, polyandry, casteism, sexism and fatalism without giving slightest indication that the present Indian society does not approve of such practices. Even in Premchand's story "Bade Ghar Ki Beti" caste prejudices are present. It is, therefore, necessary to analyse and edit the classics carefully if the selection of the stories is to support rather than detract from national values and goals.

Themes of Children's Literature

Literature can illumine the social scene and make real for children experiences far distant in time and space. Fiction can translate cold facts and figures into human terms. Therefore, children's literature can be a very good medium to indirectly give a feel of the social problems and issues to the children and adolescents. In the nature and types of themes of children's books, therefore, a definite attempt should be made to portray India as an integrated society of multi-religious groups. However, saturation of children's books with patriotic and preachy themes should be carefully avoided. Children do not like to read many themes on patriotism, religion, and great men and women. Lower grade children enjoy reading animal stories and fairy and folk tales. Upper grade children are interested in reading stories and poems involving 'Wit and humour', adventure and suspense. "Amar Chitra Katha" series and "Indrazal comics" are, to a great extent, fulfilling these needs of the children. Themes on the story of the past (on History) are included in the children's books but little or no effort is being made to present the children with the story of the future. There is an urban bias and male domination in the presentation of the themes of the children's literature. Man is shown victorious while woman a helpless loser. The women are generally presented in subordinate roles. This trend is to be changed to present a balanced picture of both the sexes and

rural and urban environment. Instead of telling children how the majority of our people are living in abject poverty, the writers should highlight the efforts of those intelligent and industrious individuals who have succeeded in overcoming the degrading problem of poverty. Besides, attempts should be made to inculcate compassion for the weaker, handicapped and backward section of the society (Chaudhari, 1976).

The modern society is based on science and technology. Therefore, every child and youth should possess some general knowledge of science. Through children's literature attempt should be invested to generate the qualities of scientific attitude, openmindedness and playing fair with the facts and individuals. Thus, children's literature can go a long way in giving balanced view of life by correcting irrationalities engendered in the child's mind through social and other influence (Chakravarti, 1969).

Comics in Children's Literature

Children are found overwhelmingly interested in the comics. In India "Indrazal comics" and "Amar Chitra Katha" are very much popular. English versions of these comics are also popular in foreign countries. It is, therefore, quite natural for the parents and educators to know about the harmfulness or harmlessness of comic books. In our country, perhaps, no study of comic books has been made. But, in the United States analysis of the content of a few comic strips and their radio counterparts has been made. Kessel (1943) and McIntire (1945) have revealed beyond a doubt the cheap and false attitudes toward life set forth in numbers of the strips they analysed. Rowland (1942) analyzing radio programmes based on comic-book themes, revealed an astonishing emphasis upon crime, a disrespect for law, and a tendency for the hero to commit as many crimes in the cause of righteousness as the villain commits in the cause of evil.

As to the effects of the comics in general, a great difference of opinion exists. One psychiatric study involving "Superman" and similar comics suggests that they may be useful in special psychiatric cases in offering an imagined security where actual

security is lacking in the child's life (Bender, 1944). On the other hand, Wertham (1948), a senior psychiatric of New York has produced evidence of the increasing number of delinquents whose cruel or criminal behaviour is often associated with the reading of comic books.

Wide differences exist among the comics. Humorous productions delight children with their slapdash humour and their harmless antics. Other comics are attempting to use the invaluable techniques of the picture strip to tell stories of heroes and events important in the world's life. The classic comics are endeavouring to arouse interest in better stories for exceedingly weak readers. Dora V. Smith (1949) has rightly pointed out that in order to ascertain the impact of comics on children, it is necessary: (1) to find out by actual examination of the comics read by the particular children in question the kinds of experiences they are finding in them. (2) to discover the effect of specific comics upon the individuals concerned; and (3) to study the nature of their appeal in order to find better materials which will meet the same needs. Schools will, perhaps, never compete successfully with the comics until they furnish a wealth of better materials of appropriate difficulty suitable for serving as a substitute.

Conclusion

The eminent Russian scholar Mekarenko (Sara, 1969) observes that only books which pursue the aim of creating and nurturing an integrated human personality are unquestionably useful for children. This, however, does not mean all phases of human activity and all branches of human knowledge and everything that we need to know, from the amoeba to homo-sapiens should find a place in the children's books. Most important consideration in selecting themes for children's books is their interest. There should be in a children's book a great deal of energy, laughter, mischievousness—all these are characteristics of children. There is an inherent art in a special sense in literature for children. It consists of simplicity of story, strict logical sequence, and absence of confusing arty words. In addition, children's literature should have a special

vividness, full-blooded colours, completely obvious realism, and exact separation of light and dark. Impressionism is out of place in a children's book. The forthright struggle of light and dark, which is in every fairy tale, should also be in every children's book. There is no need of fine psychological play or to detailed analysis. Even less appropriate is a passive, contemplative lyricism or meloncholy contemplation of nature. The difference between a children's and an adult's book is in style, not in theme—not WHAT the theme is, but HOW the author talks about it.

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Developing Creative Readers

Not only does academic success depend upon critical reading proficiency but our national welfare demands a citizenry capable of purposeful, thoughtful interpretation of ideas of others. (It is not an over statement to say that survival of a democratic society is vitally linked to a people capable of making wise choices through critical analysis.) But it is surprising to note that a great majority of people read to talk, many read to write and a microscopic minority read to think. Emerson was probably correct in his assessment that "few know how to read. Women read to find a hero whom they can love ; men for amusement; editors for something to crib ; authors for some thing that supports their views ; and hardly one reads comprehensively and wisely."

Unfortunately, no deliberate attempt is made in our schools and colleges to develop and promote the skills of creative reading in the students. Like computers they accumulate and tabulate facts from the printed page without significantly reacting to or reflecting upon them. Man is much more than a mechanical computer. He is blessed with a thinking head on his shoulders to elicit the maximum meaning from what is read. He has the capacity to think about thinking of his own as well as that of others. In the words of Norman Friedman (1969)

nothing is more dangerous than the man who says that he has no position, no point of view, no theory . . .". A merely well informed man is, surely, the most useless bore on God's earth in Whitehead's view.

Knowledge is not what one gathers from the printed page. Nor is it only a matter of perception. Knowledge, in true sense of the term, is conception and interpretation. It is the result of the creative acts of man's mind as he attempts to see and establish relationship. In order to attain this levels of knowledge one must read creatively.

In view of the unprecedented explosion of information and multiplication of printed matter, the reading instruction for the modern world cannot be restricted to "word recognition" or "literal comprehension". Helen M. Robinson (1964) proposes that "the student must be equipped to judge the veracity, validity, or worth of what is read, based on sound criteria or standards developed through previous experiences". He must be enabled to read between the lines, i.e. skill in comprehending the interpreting nonliteral language.

An examination of literature will reveal that creative reading is placed at the highest level in a hierarchy of reading comprehension skills. The hierarchy includes an inextricably involved continuum of psycho-socio-linguistic skills which range from literal comprehension, interpretative or inferential comprehension, to evaluating the quality, the value, the accuracy and the truthfulness of what is read. David H. Russell (1967) suggests four main varieties of creative reading: finding meaning implied by the author; inferring beyond the facts stated or the intent of the author, appreciative reactions such as enjoying beauty or responding to imagery; and critical evaluations. Similarly, an expert on creativity and a leading educational psychologists Dr. E. Paul Torrance (1969) wants the creative reader to do something with what is read at four levels; reproducing imaginatively what is read; elaborating what is read; rearranging and transforming. He further elucidates that the creative reader must be open to his experiences, must reflect upon what he reads, discover relationship among ideas, react to new concepts, play with the possibility that the new idea might be correct and try to imagine what its

consequences might be. In fact, these skills form the part of divergent thinking and exhibit intelligent behaviour.

Melvin Howards 1970 of Northeastern University is somewhat unconventional in his explanation of the act of creative reading. He does not consider creative reading merely a set of skills, offered in some predetermined order, nor is it confined to junior and senior high levels. Most University students who have trouble staying in school, irrespective of their major field, lack critical reading skills. They have learned too well, in grade one, that one focuses on specific skill, specific formation, and facts and that one never gets to the overall, the gestalt, view of what an author is saying. Poetry is a joy for those who can share, through the poets' words and images, or who can re-create in themselves the sensory realm and the intellectual realm of author. If one reads poetry or any great literature as an exercise in vocabulary and definition, one has missed the whole point. Such persons, and there appear to be many, do not like to read much; and when they do read, they are most likely to be literal in their understanding of what has been said and why it has been said. "It is like believing you are living in the reflection of a TV set or believing you are living a human experience by saying words quietly to yourself as you look at a book."

Melvin Howards look at creative reading from 'gestalt' point of view. He says that the whole is greater than the sum of its parts in the area of creative reading. Creative reading, according to him, is an organic whole of values, beliefs, information, feelings and conditions. At any level, it requires the total participation of a whole person in a total environment. Creative reading is the way we use words as windows through which the reader begins to see into the author and his world, beyond his words. This is the way the reader begins to see into himself and his realm of life experiences. Thus, creative reading is a blend and balance of the verbal and nonverbal, for it should be the "total immersion of the reader in what is being read".

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Self-Instructional Package Approach : A Research Design (For 10+2 Teacher Education Programme)

Background

Henry Adam's assertion has much truth when he says : "A teacher affects eternity ; he can never tell where his influence stops" (Ryans, 1969). The future of a nation depends on the quality of the young generations and this quality depends on the quality of teachers. Substandard teacher education will threaten not only the standards of education but, in ultimate analysis, the progress, prosperity and welfare of the nation (Kabir, 1959). Adaval (1973) too holds similar views and maintains that best teachers to its children, and also make constant efforts to see that the quality of teachers goes on improving continuously. Narayan (1962), Saiyidain (1968), Kothari (1966), Kirpal (1968), Shrimali (1968), Desai (1969), Adiseshia (1975), and Dave (1976) have also reiterated the need for improving and strengthening teacher education programme in order to provide good education for the younger generation. Thus, both the lay public and professional educators generally agree that the effectiveness of our education programme determined to a large extent by the teacher education programme (Vednayagam, 1976).

Given the importance of teachers and teaching in the

national life, the teacher education programmes are still not noted for their contribution to the quality of education in our country. The major weakness of the existing system of professional education of teachers have been repeatedly pointed out by the various commissions and committees since 1948. The detailed reports submitted most recently (1975) by the various visiting teams of the working group set up by the National Council for Teacher Education (NCTE), after having screened through extensive data backed up by on-the-spot observations of sampled teacher training institutions, have reaffirmed the earlier observations. The recent UNESCO publication entitled *Alternative Structure and Methods in Teacher Education* (1976) has also identified similar weaknesses in the existing teacher-education programmes in India and other developing countries. It has been observed that, although nomenclatures have changed, such as 'Education' in place of 'Training', by and large the system in practice has remained the same. The existing system is too static, stagnant and rigid to cope up with the new 'national goals', 'knowledge explosion', 'expectation explosion' and the 'future shock'. Its curricula lacks vitality, flexibility and relevance. It has not been possible for the teacher education programmes to exploit the benefits of modern technology to improve the process of human learning. Educational technology is at the handicraft stage in the teachers' training institutions. There is a great dearth of genuine and indigenous instructional material for the use of rising number of prospective teachers and again practicing teachers. With the adoption of 10+2+3 pattern of education and alternative structures of teacher education in the form of correspondence-cum-contact course, this demand for self-instructional materials, having in-built properties of flexibility, re-produceability and re-usability, has increased enormously.

In India the new pattern of education (10+2+3) is accepted as the national pattern. The corresponding thinking at the national and state level is gaining momentum. Most of the states have already implemented the new pattern whereas others are in the process. A number of organizational, financial and academic difficulties have been highlighted by various

forums. Any re-organization of school system, according to Goodland (1970) must accompany a corresponding change in the teacher education programme and strategy. Thus, one of the challenging difficulties is how to design a suitable teacher education programme for this pattern. The national bodies like the NCERT, UGC, etc. are busy meeting this challenge. The NCTE (1976-77) had worked out a structural and curricular outlines for the 10+2+3 stage teacher education programme and recommended the preparation of "Core training packages" and "special training packages". Whatever structural model of teacher education is adopted for the new pattern of school education, one thing is obvious that we do not have satisfactory instructional details of the curriculum. As a matter of fact, this is going to be a serious problem of seventies and even early eighties. Hence, adequate research efforts are sincerely needed for the development of instructional and training packages.

The question arises : have we established strong centres/units which would devote to this important and complex task of developing instructional materials ? An examination of the work being done by various national and state educational agencies would reveal that the area of curriculum development was not the spot of their major focus. On examining the efforts aimed at developing instructional materials at the university and school levels, we come across bodies like state Grantha (book) Academies, Institutes and University Departments financed by the UGC, and the State Textbook Corporations/Bureau. In every state one Grantha Academy was established, with an initial grant of rupees one crore, to write and translate University level textbooks in the regional languages. But, these Academies did not make any effort for producing multimedia instructional materials, especially, for the teacher education programme in the context of 10+2+3 pattern of education.

Recently, the UGC has given financial support to some of the Universities and institutions to study the various branches of the discipline of Education. This support was given to the Departments of Psychology of Utkal and Allahabad Universities, Departments of Sociology of Delhi and Bangalore Universities, Tata Institute of Social Sciences, and

Department of Economics of Bombay University. These institutions are concentrating their research efforts on Educational Psychology, Sociology of Education, Economics of Education, etc., but nowhere, perhaps, in the country, an Institution/Department is exclusively engaged, with sufficient resources, in the research work for development of curriculum in teacher education as envisaged by the changed pattern of education.

We have State Textbook Corporations to produce suitable textbooks for schools. The NCERT has also directed a lot of its attention to the aspect of preparing textual materials. Production of instructional material is one of the most important activities awaiting the attention and concern of educational researchers and technologists to give our indigenous instructional materials. So far as the production of instructional materials in the area of teacher education is concerned, it has gone more or less under-noticed or unnoticed. Various commissions, committees and educationists have underlined the importance of developing indigenous instructional materials for teacher education programmes. Recently Kaul (1977) has favoured setting up a "Centre for Curriculum Development, to give fillip to the activity of preparing instructional packages for secondary school teacher education programmes. We strongly believe that a timely action is necessary to support and promote the efforts directed towards the development of curriculum for teacher education in the context of new pattern (10+2+3) of education.

The SIPA Strategy

This is an approach to work out the idea of producing multimedia instructional packages/modules for teachers education programme in the context of 10+2+3 pattern of education. In this programme an attempt would be made to develop Multimedia Instructional Modules (MIMs) for the pre-service and in-service teacher education programme keeping an eye on the 10+2+3 pattern. Every MIM will be based upon a significant teaching-learning unit of teacher education syllabi. It will comprise : the background of the concerned teaching unit,

objectives of its teaching, teaching-learning materials, practicing exercises, evaluation of tools and references for further study for the trainees and the trainers. The MIMs will be prepared in the semi-programmed form. These materials will be produced in the form of a booklet. For clarity and emphasis slides, small charts, cartoons, and time diagrams will also be included. Some of the controversial and important teaching points would be made available in the form of audio tapes.

The rationale behind developing such MIMs is to strengthen and upgrade the formal and non-formal teacher education programmes by making available readymade complete modules of various teaching-learning units for the benefit of the trainees and the teacher educators. The NCTE (1976) in their draft approach paper have rightly observed that a broad and comprehensive model of teacher education may provide the framework for the overall development of teacher education in India. It should be possible to develop multiple teacher education modules catering to the needs of the states and the regions within each state. In fact, such modules are necessary to meet the challenge of keeping the 2.7 million teachers of India to make them alive and alert to their professional responsibilities. The MIMs developed through Self-Instructional Package Approach (SIPA) can be adopted with advantage along with the Radio, TV and correspondence-cum-contact programmes in view of its properties of flexibility, re-produceability, re-usability and micro-cum-macro appeal. These MIMs [can be adopted and duplicated on large scale in different regional languages.

The SIPA is flexible in the sense that each of these MIMs is independent and comprehensive. Therefore, the institutions, the trainees and the teacher educators can select the module of their own choice and requirement. They have even the freedom of sequencing the modules according to their needs. In the same way the in-service teacher education agencies can also make use of these modules for the summer institutes, refresher courses, seminars, etc. Besides these modules can provide a useful and effective strategy for individualizing and mass instructionalizing the training programme. On the one hand the learner can use the modules at his or her own pace,

and on the other hand the MIMs can be utilized for teaching the large classes by a team or an individual teacher.

Thus, the SIPA aims at combining the advantages of modern educational thought and practice with the traditional textual type of material. In specific terms, the following can be the objectives of the SIPA approach :

1. Production of instructional MIMs relevant to Indian conditions having the properties of flexibility, reproducibility and micro-cum-macro appeal.
2. Provision of a strategy for preparing multimedia instructional modules for the use of pre-service and in-service teacher education programmes.
3. Promotion of pre-service and in-service preparation of teachers for the new pattern of education (10+2+3). In other words, use of the MIMs would help in accomplishing closer links and sharing of responsibilities among teacher education institutions, state departments of education and school systems.

MIMs can be prepared on the following skills :

1. Observation of classroom behaviour through Flander's Interaction Analysis system, Gallagher and Aschner observation system and Bellack observation system.
2. Identification of behaviour underlying conceptual learning, questioning, oral expression, blackboard writing and use of some audio-visual materials.
3. Development of specific skills like demonstrating, stimulating and conducting discussions, and directing individualized learning.
4. Concept development, methods and principles of learning remedial teaching and construction of achievement test.
5. Promotion of creative thinking and problem-solving abilities.
6. Development of social skills in the trainees for coming in closer contact with people, particularly, with those

- belonging to underdeveloped sections of the community.
7. Development of skills to locate work-situations appropriate to immediate environment.
 8. Development of skills for organizing co-curricular activities and activities related to Physical education.
 9. Preparation of MIMs on certain selected units related to the teaching of Hindi and Geography subjects.

The SIPA strategy would employ various approaches of research : library studies, experimental study within one instruction with a common design. The research workers would be selected having background experience in curriculum development and in the production of instructional materials. The programme will be phased into the following five stages :

STAGE I : Preliminary Exploration

In this stage important characteristics of target institutions, in-service teachers and pre-service teachers will be identified and studied. This would provide the description of the background situation within which various MIMs will be tried out for the purpose of their development and use.

STAGE II : Preparation of MIM-1

Having gone through the related literature and discussions with the teacher educators, teacher trainees, in-service teachers and research workers, the MIM-1 would be distinct in its Indian context with respect to content and culture, simple language, plurality of examples, objectives specified in behavioural terms, semi-programmed text, exercises to examine comprehensibility and applicability, and reference materials, etc. The MIM-1 would be prepared in textual and audio-visual form. Thus, MIM-1 will be ready for pre-try-out.

STAGE III : Pre-try-out of MIM-1

The pre-try-out would aim at examining the simplicity of contents, clarity of language, sufficiency of examples and style

of presentation. For this purpose two types of respondents will be used : (a) research workers, and (b) in-service teachers.

The small sample of ten in-service teachers and two research workers would be drawn from within the institution and nearby places. Large random sample would not be the criteria of selection. The structured reaction of these respondents would be collected through open-ended questions and interviews. The content analysis would be employed for identifying the main points of criticism and suggestions for the improvement of MIM-1. Incorporation of these criticisms and suggestion in MIM-1 would result into MIM-2.

STAGE IV : Try-out of MIM-2

The MIM-2 will be tried out with pre-service B.Ed. students having modified syllabus in the context of 10+2. The "pre-test-post-test-parallel group" design would be adhered to. The criteria of effectiveness will be in terms of attitudes towards the MIM and the SIPA. Another additional criteria will be relating to achievement scores for the concepts and skills developed through respective modules (MIM-2). The comments will be sought from trainees for improving the MIM-2 on dimensions of contents and style of presentations. The effectiveness of MIM-2 will be examined in terms of attitudes and attainment scores for the concerning skills. In the light of the qualitative comments the MIM-2 will be improved to result into MIM-3 which would be further subjected to main field testing.

STAGE V : Main Field Testing of MIM-3

The MIM-3 would be tested in the main field setting with five teacher-training institutions in different parts of the country. The methodology and procedure for this stage would be uniform throughout the five institutions, and it would be as per the stage-IV given above. The sample would include about 400 teachers from cooperating training institutions.

In order to execute the research programmes suitable sets of tools would be developed. A detailed Manual would also

be prepared containing the background information of the development of MIM, and technical details giving guidelines for their operation and use. Having passed through these stages the MIMs would finally result into marketable training packages for the use of teachers training institutions.

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Nationalizing Examinations

In order to delink university degree from employment and to ensure uniform standards, the UPSC had put up a proposal in 1976 to the centre for holding a job-oriented National Merit Examination for the whole country. Besides, the Commission has made many claims to revitalize the anaemic academic climate of the country. Howsoever, tall claims the commission might make, it would be a gigantic task of formidable magnitude for the commission which was already conducting 27 different competitive examinations for nearly 90,000 candidates at 20 different centres.

The main purpose of organizing the national examination is to give a passport for employment to every deserving candidate. But, in view of the nonavailability of adequate number of jobs many of the successful candidates in the National Examination will be forced to turn to higher University degrees defeating the objective of divorcing degree from employment. I think employment can be delinked from degree only if for every job persons are selected from among those candidates who possess the minimum appropriate qualification and persons holding higher degrees are forbidden from competing for the post. If this policy is adhered to sincerely, in due course of time, the race for degrees will be slowed down. Moreover, candi-

dates with higher degrees will be relieved of the feeling of frustration and rebellion as a result of joining lower posts.

The proposal of holding a National Examination will certainly lead to dual system of examination—one at the national level and the other at the University/Board level. Will it be essential or even desirable for the Universities and Boards then to conduct examinations for degrees? I think, in that case, it would be sufficient for them to certify completion of the courses in a stipulated period. If conduction of such an examination is inevitable, it can be done more efficiently by setting up (or converting existing ones) a 'National Examination University'. Its exclusive job would be to conduct National Examination, to report regional disparities in standards and to maintain a National Register of meritorious candidates. As recommended by the *Education Commission* (1964-66), it can also function as a 'National Evaluation Organization' and can conduct research and training on various aspects of evaluation and testing. But, it is still unknown how would the ambitious scheme of National Examination answer the question of copying or cheating in the examination hall?

It is a well known fact that because of economic, social and regional pressures almost all the states gives preference to the 'sons of the soil' in selection for employment. Again, the states will pick up the 'sons of the soil' from the list of successful candidates in the National Examination. Thus, the order of merit from the point of view of employment will be disturbed and the sanctity of the National Examination will be lost. However, the UPSC is a recommendatory body and hence its decisions or directions will not be a binding on the state governments. It would be more convenient to the state governments to have selection for various posts through the state PSCs.

It seems that idea of National Merit Examination is, in disguise, an attempt to nationalize examinations or to dictate Delhi's standards to all. Sometimes back there was also a suggestion from the Union Home Minister of State to catch the would be I.A.S. young. All these speculations to delink University degree from employment are impracticable and

luxurious propositions. They do not take into account the national cultural reality. Who can deny the widening regional imbalances in education? Who can discard the city-blindness of all our thinking and planning? Who can reject the privilege-bias of our educational institutions? Where is the 'common school' to have common or uniform standards? How can you expect students from Bastar or Jhabua in Madhya Pradesh to compete with the students of Scindhia School of Gwalior or Daly College of Indore?

For high achievement in such examinations as proposed by the UPSC, one needs superior (or sophisticated) language-ability which is mostly the privilege of the urban 'Vocal Culture'. The rural and working class 'silent culture' possessing non-formal (unsophisticated) and different language cannot compete with the city-dwellers. Hence, howsoever talented, the candidates from culturally deprived homes will be under-achievers on these tests. Therefore, it is not in the larger interest of the Indian society to hold a national examination without removing regional disparities in education.

To distribute the results of the National Examination evenly, the foremost requisite is to raise the standards of all educational institutions to national optimum level. This implies better educational facilities for rural and slum areas to compensate the cultural disadvantage. This has also been pleaded in the *Plowden Report* (1967) of Great Britain. Unless this disadvantage is compensated by locating best institutions in slum and rural areas, the schemes of holding National Examination or catching the prospective I.A.S. young would certainly perpetuate and reinforce the division of the Indian society into 'class' and 'mass' against all official socialistic pronouncements.

Improving Teaching of General Science

Proficiency at Science has been associated with special, rather than with general, ability. Little attempt has been made to relate its teaching to the rest of the life of the school or community. The old division between 'Humane' and 'Scientific' studies is still hanging like a cloud over all our higher education. Introduction of the study of 'General Science' has enabled pupils in brushing off this unwanted cloud. Moreover, this subject of General Science strives to provide social stimulus and intellectual training which is the incumbent responsibility of any scientific study. Through the teaching of 'General Science' the best balance of intellect and character can be effected. In fact, this subject endeavours to revive the lost coordination among three cultures—the Literary Culture, the Scientific Culture and the Technical Culture. In a nutshell, it is a wise step towards humanizing science.

1. Concept of General Science

General Science has been introduced in the curriculum to impart extensive or General Education in science to every student irrespective of his special aptitude. General Science, therefore, can be defined as 'Every day Science for every body'.

It aims at the orchestral unity of almost all the sciences, that can be established by breaking down the barriers of special sciences. It has a broad scope and can be applied to a broad range of interests. It was neither intended that General Science be made up of a smattering of specialized sciences nor should its courses touch upon every aspect of science. It has its own body of subject matter chosen to meet the needs of the pupils who offer it. The Norwood Report 1941 reads "... General Science is the name given to an elementary course of study of natural science for which the subject matter, related whenever practicable to the every day experience of pupils, is drawn from the whole field of natural science and treated as a coherent whole so that the question of the traditional division into separate science subjects such as Physics, Chemistry, Biology, Astronomy and Geology does not arise".

The syllabus of General Science by the scope and treatment of its subject-matter is designed to give pupils some knowledge of natural laws and their applications, some acquaintance with scientific methods of thought and investigation and some appreciation of the influences of scientific thought and achievement on human lives. In short, General Science is a general course in science with emphasis on practical application and observation.

The concept of General Science can further be classified by stating that it should not be treated as synonymous with elementary science. In fact, its field is wider and meaning deeper than that of the latter. It has been warned that "while making the treatment of the subject-matter popular and less technical, it should not remain just elementary since it has to be functional and hence up-to-date". In view of the increasing industrialization and urbanization of villages in India the quantum of General Science is bound to become more complex. The syllabus in General Science should, therefore, be broad based in view of its functional nature and comprehensive concept.

Many of the teachers and even the principals of Higher Secondary Schools are not fully conversant with the idea or concept of General Science. I have heard teachers and principals branding it a bogus and pseudo-subject. No doubt, this attitude is an obstacle in the way of teaching of General

Science. Persons ignorant of the meaning of General Science can hardly do justice with the subject and the learners. Therefore, the first and foremost requirement for the improvement of teaching and learning in General Science is to make the General Science teachers well informed about the meaning or concept of General Science. By organizing Seminars and Short Term Courses training colleges can advantageously bring home to the teachers the functional nature and comprehensive concept of General Science.

2. Teachers

Despite the clear instruction of the Board of Secondary Education that only trained science graduates should teach General Science to the Higher Secondary Classes, several science graduates and undergraduates are teaching the subject in the Higher Secondary Classes. This has bred disinterest towards the subject among the students and has deteriorated the standard. The unqualified teachers simply decorate the chair and order the students to read the text. As they are untrained they fail to follow the 'Concentric Plan'. They teach only those topics or units which do not tax them and rest of the topics are either postponed or omitted. For this reason, it is essential that the teaching should be entrusted to those who love the subject and believe in its value.

I admit that the comprehensive concept of General Science renders difficulty in teaching the subject as it is comprised of almost all the science subjects. Therefore, we cannot expect from a science graduate to have the knowledge of all the branches of science. In order to strike out improvement in the teaching of General Science, it is imperative to introduce General Science as a subject at the collegiate level. Secondly, for quick and immediate outcome a training for specialization in General Science teaching is to be organised with emphasis on laboratory management and skills, such as,—glass blowing, soldering, metal and wood-work. Thirdly, to equip the students with desired grounding in the subject, General Science is to be made compulsory at the lower secondary stage. If this

is done, pupils would not find General Science a strange and foreign subject.

3. Science Equipments

Acute shortage of qualified teachers, resources and facilities also stand as a hindrance in the way of General Science teaching. This state of affair does not permit the teacher to organize time consuming activities like field-trips and visits to places of scientific interest. Inadequacy of staff again breeds difficulty in designing the time-table. There is no well equipped laboratory in many of the schools. In most of the schools two periods of forty or thirtyfive minutes are assigned for the teaching of General Science which are insufficient. In order to do justice with the subject at least three periods per week are to be allotted. Out of these three periods one is to be fixed for practical or laboratory work. Besides, the schools should be furnished with adequate number of science-teachers and other science equipments.

4. Science Clubs

No doubt Science Clubs are very good mediums for teaching several units of General Science, but they are expensive too. In view of the proverbial poverty of parents, the teachers find it difficult to collect funds for running these Clubs. Hence, liberal grants are to be given to these Clubs so that they can be utilized for the improvement of teaching and learning in General Science.

5. Text-Books

A good text-book in General Science, is a compact preparation of accepted instructional material. Undoubtedly, such a preparation should be systematic and based upon the latest information in the area of science teaching. Moreover, it integrates the best efforts of Educational Psychology, Philosophy and practical teaching experiences. But, most of the current text-books in General Science are quite short of the standard

and quality. As the teachers adhere much to the text-books, it is all the more important and essential to effect improvement in the quality of text-books.

The subject-matter of General Science text-books should not be unduly factual. Adequate attention should be paid to the inculcation of basic concepts, essential skills and desirable attitudes. For this, pupils should be stimulated to observe, to record and to draw conclusions of their own. The content should provide the pupils an intelligent understanding of their immediate environment and full awareness of their surroundings.

6. Science Library

It is a common observation that the school libraries are overfed with the books of humanity-group. They are palpably short of books on subjects like Science or General Science. The school library can play an important part in the improvement of teaching and bearing in General Science if they are adequately equipped with interesting, instructional and well written books on science subjects. This can prove as splendid aid to the teacher in his work and can give the pupils a wide knowledge of scientific matters of all kinds. Nevertheless, such books can engender an interest which is likely to be retained after the pupils leave the school.

7. Observational Work

A major objective of General Science teaching is to inculcate habits of observation, collection and investigation. This objective inherits the scientific method of learning. In order to achieve this, stress must be laid on observational work which is the core and crux of General Science programme. If this is done regularly, tangible improvement can be effected in the teaching and learning of General Science. Pupils should be stimulated to observe and to record their observations, as far as possible, in the natural environment. Pupils should be asked certain objective questions to enable them to draw their own conclusions. This can also be done through experiments. The observational work may advantageously be confined to :

1. Recognition of certain plants and leaves;
2. (a) Recognition of some common animals and birds resident or migratory;
(b) Preservation and collection of insects and some invertebrates;
3. Visits to selected places to study and collect plant and animal specimens and to study the general geography of the place and other available information;
4. Collection of specimens of rocks, soils, minerals, fossils and other items of geographical interests found in the locality and also at other places.

For effecting improvement in the teaching of General Science teachers should keep in view the following points :

1. *Dullness and Details be Avoided*

Dullness should not be allowed to permeate the teaching of General Science. The teacher must endeavour, throughout his lessons, to maintain the interest and keenness of the pupils. Here, it is pertinent to point out that the details of scientific theories and numerical deductions should not unnecessarily burden the minds of the pupils. It is a common experience that such details breed distaste for the subject and ultimately mar the interest of the pupils.

Facts of science should be presented in their social and cultural setting. Undue stress on technical details and scientific theories should be avoided. Science should not be taught just for its own sake, but it should be used to give a proper perspective to significant social, cultural and economic developments in the country. Moreover the concepts treated and activities suggested should fall within the range of understanding and ability of the pupils.

2. *Broad Based Teaching*

The teaching should be kept on as broad a basis as possible. The pupils studying General Science should acquire knowledge of the fundamentals of science useful to all in every day living.

3. *Developing Skills*

The teacher should enable the pupils to acquire drawing, experimental and constructional skills. Besides, they should also be stimulated to develop the power of oral expression in science. They should be able to discuss, argue, describe and raise questions using scientific terminology. Thus the students would be able to develop the scientific method in thinking and action. In order to achieve this, display of pictures and illustrations in classrooms or laboratory and organization of occasional lectureries by the pupils are essential.

4. *Reference to Scientists*

To inspire and encourage the young pupils, the teacher must introduce into his teaching, whenever practicable, the names of eminent scientists with a brief reference to their lives and achievements.

5. *Developing Scientific Interest*

The pupils should be stimulated to develop interest in scientific readings and hobbies. The teacher should see that his pupils adopt the scientific attitude in making statements, accepting informations and forming beliefs.

6. *Developing Appreciation for Scientific Achievements*

The teachers should endeavour to cultivate a sense of appreciation in his taughts for the impact of science on life—both personal and social and for the various advancements made in the field of science and technology.

No bibliography of protest defy incorporation here to emphasize that the teacher is the pivot on which the whole earth of education revolves. Hence, for effecting improvement in the teaching and learning of General Science greater responsibility rests on his shoulders. "He can outstandingly do better in this field by keeping in view the concept of the

subjects, its aims and objectives, the interests, needs and concerns of the pupils, the tradition, beliefs and customs of the community, the scientific level of the society, its immediate and remote needs, the psychology of learning, the principles of pedagogy and such other relevant factors."

Teaching and Learning of Science

The world is passing through a revolution in science. Though the storm-centres of this revolution rest in the countries of the west, yet India and other developing nations of the east are feeling its impact in almost every walk of life—health, industry, agriculture, communication and transportation. Our progress, welfare and security have become directly dependent on the advancements of science and technology. “The effects of science on human life and thought are so great, and are potentially so much greater that those who have no understanding of them, cannot be considered properly educated or truly cultured and therefore are unable to participate fully in the life of their times.” Hence, science has to be recognized as a basic component of education and a rock foundation of the entire citadel of the educational structure.

Ferment in Science Education

To keep pace with the progression of science, a change in the approach and technique of imparting science-education was identifiable in the countries of the west in the nineteen twenties and thirties. It began to gather momentum just after

the world war two. Then, an unprecedented eruption of activity in science-education was witnessed. In the year 1957 when the Russian Sputnik was known to the world, this concern about science-education was increasingly intensified.

The National Science Foundation and other private trust in the U.S.A. initiated a number of curricular reforms which were completed in early sixties. Culminations of efforts in England was a generous grant by the Nuffield Foundation to embark upon an ambitious science teaching project. The organization for European Economic Development stated in 1963 : "We believe that it is necessary to change completely the content of school physics courses, the attitudes of mind of the science teacher towards his aim and purpose which the teaching of physics is considered to fulfil. Nothing less than a radical change will suffice." In our own country the institutions like U.G.C. and N.C.E.R.T. have also, more than once, emphasized the need for a coordinated plan of action for an overall improvement of science-education. These bodies have also reiterated the desirability of partnership between the college and school teachers in this direction.

Science and Economic Growth

It is realized by both the developed and developing nations that science is a potent and prime mover of economic growth. Science is capable of transforming the economic configuration of an underdeveloped country, and of raising the standard of living by increasing productivity—industrial and agriculture. "The wind that blew over the western world touched India. And through the documents of the five year plans the emphasis on manpower, scientific and technical personnel reflects this intensive thinking on the part of the educationists, social thinkers and economic planners of our country."

In the post independence period our national attitude towards science underwent a great change. The need for a pervasive change in the system of science education from the school to the higher level was keenly felt, specially through the efforts at planned development. Our great leaders pointed out that there cannot be a future for us without science and

technology. "The technical achievement of science" says Pt. Nehru "are obvious enough : its capacity to transform an economy of scarcity into one of abundance is evident, its invasion of many problems which have so far been the monopoly of philosophy is becoming more and more pronounced."

Science and Democracy

In no other form of government science-education is more essential than in democracy. As a matter of fact science and democracy draw inspiration and support from each other. Science plays fair with the facts while democracy plays fair with the individuals. Science enlightens democracy and democracy humanizes science. Science cannot be segregated from democracy without the danger of partial starvation.

In a free democratic society the immature young generation is exposed to numerous external influences of caste, creed, language, religion and traditions. They are also exposed to publicity and propaganda by the mass media of communication. There is every possibility of their being led away by the charming words of the notorious talkers and hypnotizing slogans of the demagogues. The young people, probably, can be enabled to cope with these influences by developing in them a scientific way of thinking.

Science-education can play an important role in a democratic society by cultivating in the students traits which are typical of a true student of science. It can develop in them a habit of reasoning, weighing evidence and exercising caution in accepting statements. This can relieve them from the shackles of superstitions, dogmas and prejudices. Science-education can also cultivate in them a skill of tactful persuasion and a "sense of style which hates waste, economizes material and prefers good work", and thus making them skillful producers and adroit consumers.

Present Condition of Science Teaching

Science is the intellectual nursery for the next generation

of scientists and technologists. For later training in science our school-pupils need a foundation of good understanding, a something well learnt and understood as clear knowledge, rather than a memory packed full of details. Besides, the teaching and learning of science must keep pace with the terrific march of science. "In fact so far our learning in science has been basically the same as it was a few centuries ago, and we have been learning it in the same way as we have been learning any other subject including classics."

We are still clinging to the older view-point that science is only a collection of facts and principles. And that like any other subject it can be traditionally taught and learnt. The syllabus is dull and outdated. It has failed to generate and develop a spark of enthusiasm for science in both the teacher and the learner. The textbooks are full of isolated dead bits of information. They lack the investigatory approach which is the real spirit of science. The classroom have become lesson hearing rooms where the students are told about the facts and are expected to commit them to memory. Thus, the authoritarian tradition-bound methods have reduced most of the science teaching to mere 'mind filling' in place of 'mind making'.

In the laboratory too the approach is confirmatory rather than investigatory. Teachers treat science as a game of getting exact answer. Contemplation and creation on the part of pupils find a little or no place in the whole process of science teaching. The spirit of inquiry is conspicuous by its absence in the routine lectures and demonstrations in the schools and colleges.

The *Education Commission* (1964-66) has warned us with the grave consequences of poor teaching and bad learning practised in our schools. They have observed that "if science is poorly taught, badly learnt, it is little more than burdening the mind with dead information, and it could degenerate even into a new superstition".

The main drawback of science teaching in our country is that instead of striking a balance between the 'content' and 'method' or 'product' and 'process' we have been emphasizing

all through these years only the 'knowledge' or 'product' aspect of science. The 'process' aspect has been relegated to background. This has led our children and youth to blind learning of scientific facts and figures without understanding their significance or use. They have become simply "consumers of scientific achievements, never interpreters or appliers or producers of new ideas". A lack of scientific outlook is discernible even in the Masters and Doctors of Science.

In a study on prospective science teachers' perception of the ideal pupil Dr. M.K. Raina (1970) has observed that teachers and teacher educators, by and large, both in this country and the United States, have been found to inhibit creative behaviour. It has been found that they usually eulogize 'gold like' and not 'uranium like' talents. He has further pointed out that prospective science teachers in India are militating against one of the fundamental principles of human growth and developments because they tend to reward obedient, courteous, conventional and conformist behaviour of the students, which stifles the spark of creativity.

Need to Teach for Transfer

Strong claims have been made for the value of science in training students to think scientifically and in developing in them a scientific attitude towards the problems of life. "There is no guarantee that such results will be obtained unless teachers of science devise methods that stimulate students to carry over the material of the science course to a solution of a great variety of problems that arise in everyday life." Attainment of higher virtues, like scientific attitude, would be wonderful, but science teaching cannot confer these benefits on pupils unless the training given in science classes can somehow be transferred to other fields of study and to life in general.

The philosophy of education and the theory of transfer are interdependent. In its broader sense something like transfer of training (or learning) is basic to the whole notion of schooling. Without our reliance on transfer teaching would be hopelessly

specific and higher education would seem worthless except for professional training. Mursell (1952) has observed that transfer is a criterion of learning and that if transfer cannot be made from one situation to another, it is because real learning in terms of understanding has not taken place.

Formal education has always been based on the assumption that the individual will apply what he has learned in school to situations and problems he encounters in daily living. People learn skills to master a trade, master language usage in order to communicate more effectively in the future. Students are not only expected to retain things learned in the school but to apply them in different situations.

The only object in teaching a child to count ducks is to teach him to count anything that can be counted. Similarly, our object in teaching science is to develop a disposition in the boys and girls to use the knowledge and method of science in solving the problems faced in life situations. The students are expected to evidence scientific outlook not only in the classroom or laboratory but also in home, factory or farm.

Early in this century experimental investigations by psychologists indicated that transfer of learning is a myth. But, fortunately as shown by the later studies, there is some transfer, and it may be considerable under favourable circumstances. Dr. A.K. Sen (1969) of Calcutta University in an experiment designed to determine the effect of prior learning on subsequent learning in a paired associate task found that with three degrees of prior learning, the results show a marked facilitation in learning the second list, when the prior list has been learned to a higher degree.

The subject matter of science offers numerous opportunities and favourable situations for transfer to take place. It presents challenge for intellect, opportunities for active involvement and situations for working out generalizations.

Transfer is deliberate and not automatic. Therefore, the teacher should make attempts to secure positive transfer. For that pupils' involvement with reasonable guidance and restricted permissiveness is essential. A.M. Whitehead has pointed out that the pupils have got to be made to feel that they are

studying something and are not merely executing intellectual minutes. Guthrie has made the same point when he says that a student does not learn what was in a lecture or book. He learns only what a lecture or book causes him to do.

Does Science Desacralise ?

Well known human psychologist A.H. Maslow has revolutionary views on science teaching. He opines that science has come to mean primarily practice, caution, carefulness, slowness and the art of not making mistakes, rather than courage, daring, taking big chances, gambling everything on a single throw. Our orthodox conception of science (as mechanistic and a human) seems to him one local manifestation or expression of the larger more inclusive 'weltanschauung' of mechanistic dehumanisation of which it is a part.

Student is rewarded only for being patient, cautious, stubborn, controlled, meticulous, suspicious, orderly, neat and the like. "Some effort is made to train out of him his wildness, his unconventionality, his rebelliousness against his elders, his poetic and aesthetic qualities, his gaiety, his 'B-humour', his craziness, his impulsiveness, his feminine qualities, his mystical impulses and much more besides." This is why many brilliant students drop out of science. They are asked to give up too much of their human nature, too many of the rewards of living, and even some of the main values that led them to think of science in the first place. In effect, they are asked, like monks, to renounce some very precious aspects of the world. And this is doubly true of just those students who are most likely to be creative ones, the innovators.

The science teachers not infrequently adhere to the "nothing-but-attitude" in the teaching of science. They teach: "a human being is really nothing but \$ 30 worth chemicals" or a rainbow is nothing but the scattering of white light into colours by droplets acting like prisms. This is a sort of devaluation of child's experience. Teachers should not pose a threat to everything that the students hold marvellous, beautiful, valuable, sacred and awe-inspiring. Otherwise the

picture of life in the minds of science students would be bleak, cold and mechanical. Science should get rid of this quite unnecessary 'taboo on tenderness'. So far as science is considered, the self-actualizing healthy people teach us, says Maslow, that there is no real opposition between caution and courage, between vigour and speculation, between tough minded and tender minded. These are all human qualities, and they are all useful in science.

School Complex : A New Concept

Educational thinkers now look at 'education' as a life-long multi-dimensional integrated process of learning. Education Commission (1964-66) also emphasized this point of view. It has impressed upon the educational workers to see education in this perspective and to treat education as an integrated continuous process from 'nursery school' to 'Janta College'.

In fact, education is a seamless robe. To fragmentize it is to deprive it of the advantages of mutual sharing and support. At least for a century the cause of education has suffered a lot on account of the isolation (or insulation) of institutions at different levels. Even at present, the four stages—primary, middle, secondary and college—can be likened to the four 'Varnas' of Hindu society. Institutions at one level look down upon at the other. They very often suffer from superiority or inferiority complex. Among them primary stage is the worst affected and the most miserable stage. Union Ministry of Education has done a commendable job by establishing 'State Institutes of Education' in every state to uplift the primary stage—the fourth 'Varna' of educational structure.

Kothari Education Commission (1964-66) is a step towards encouraging socialistic tendencies in education. It has envisaged a novel concept of 'School Complex' to mitigate the

complex that exists among the educational institutions of different levels. It has attempted to remove the isolation that obtains among the different stages of education. By putting forth this new concept the commission has recognized the importance of 'group work' and 'cooperative planning' in the field of education.

Although number of years have elapsed since the submission of the commission's report, yet a small number of people and institutions have come to know and appreciate the idea of 'School complex'. Therefore, before translating this idea into practice it is imperative to create an awareness of the concept of 'School complex' in the teachers, educational administrators and parents.

We know that the fate of a new idea depends largely upon the initiative, drive and vision of the heads of educational institutions. It is also well known that many of the heads of schools and colleges are conservative in their outlook. They do not welcome a change or an innovation readily in their institutions even if it does not involve any financial burden. Fundamental change, says Hoyle, is only possible when an institution is in sound 'organization-health'. Hoyle develops this medical metaphor by suggesting that innovations fail to 'take' because of tissue rejection by a school that lacks such organizational health. The healthy state that makes the institutionalization of innovation possible can be achieved by changing the role of the head so that teachers are more involved in decision making and by instituting greater collaboration amongst teachers, who must also develop 'extended professionalism' so that they see their work in wider educational context.

Ours is a poor and developing nation. We could hardly afford to invest 2.9 per cent of our national budget in education. Today, the greatest problem of education is the problem of adequate funds. It would not be even possible to contribute 6 per cent of GNP for education by the end of 1985. Hence, there is no point in waiting for the day when we shall roll in the lap of 'Lakshmi'. Time is the essence of all problems. We ought to make the best use of whatever little is available in the laboratory, library and workshop of our schools and colleges.

'School complex' provides a fine opportunity for building a cooperative commonwealth of neighbourhood schools to share and exchange the ideas and articles.

There are numerous problems to be studied and remedied relating to the primary schools of our country. Since the dawn of independence nothing substantial has been done in the field of elementary education which is the foundation of all educational superstructure. We have to plug 'wastage and stagnation'. We have to reform and upgrade the curriculum, improve the textbooks and teaching aids. The state of science teaching at this level is in a very bad shape. It is taught like language and history subjects. If this is allowed to drift further science shall degenerate into a dogma. The curiosity, imagination and enterprising ability of our boys and girls will be fossilized and doomed.

We are living in a world which is based on science and technology. We have adopted democracy as the form of government. We, therefore, need proficiency in science and the art of communication, that is, language. Science and language are two legs of the modern civilization. Unless we learn these two basic subjects proficiently we can neither be called properly civilized nor educated. Hence, it is the obligation of each 'school complex' to concentrate first on the improvement of teaching of science and languages.

We have not yet drawn our attention seriously to the teaching of languages. In the name of language we have been teaching literature to the students during the past years. The teachers of elementary classes hardly pay sincere attention to the development of four fundamentals of languages learning, that is, listening, speaking, reading and writing. The contents of language (Hindi) textbooks have also been selected from the literature point of view. The teachers should remember the old maxim that 'every teacher is a language teacher'. In a sample survey of primary schools of New Delhi (1979), it was revealed that more than 50 per cent of the first standard and more than 25 per cent of the second standard students, cannot read. Therefore, we must raise the slogan of "back to basics". It is an additional obligation of the language teacher to build a firm foundation of language at the elementary

stage. Indeed, language is the key to education. It is the language ability that helps us in generalizing and transferring learning from classroom to daily living.

As discussed earlier, the objective of introducing the idea of 'school complex' is, firstly, to break the isolation of schools and to help them, secondly to function in small face-to-face cooperative groups, and to make delegation of authority possible. Thus, in the new scheme of administration and supervision the 'school-complex' itself will perform certain delegated task which would otherwise have been performed by the department and deal with the individual schools within it. Under this programme, the school will gain in strength. It will be able to exercise greater freedom, and will help in making the system more flexible and dynamic. The department will also gain. It will be able to concentrate its attention on major essentials and can afford to have fewer officers but at a higher level of competence.

The idea of 'school complex' executed steadily, intelligently and honestly can prove a great asset to the department. And the state education department in return can grant greater autonomy and facility in the area of curriculum and evaluation. The 'school complex' can be authorized to modify or revise the syllabus to get rid of the junk and lumber graded in it. They can also be entrusted with the important job of preparing, trying out and evaluating the textbooks.

To make it amply clear, school-complex is not a legislative assembly of educators but it is a body of educational practitioners entrusted with the responsibility of improving the teaching-learning situation in the educational institutions by exchanging men and materials owned by the complex. As a matter of fact, this is an excellent attempt towards building a commonwealth of schools. Its success depends entirely on the capacity, ability and will-to-do of the partners. While carrying out the project of 'school complex' every participant must remember the words of Henry Ford that "coming together is a beginning, keeping together is a progress and working together is a success".

Work Experience and Socially Useful Productive Work

Writing in *Harijan* (July 31, 1937) Mahatma Gandhi observed : "As a nation we are so backward in education that we cannot hope to fulfil our obligation to the nation in this respect in a given time during this generation, if this programme is to depend on money. I have, therefore, made bold, even at the risk of losing a reputation for constructive ability, to suggest that education should be self-supporting". He was also of the view that literacy in itself is no education. He, therefore, recommended that child's education should begin with the teaching of a useful handicraft and enabling him to produce from the moment he begins his training. Thus, every school can be made self-supporting ; the condition being that the state takes over the manufacture of these schools. Mahatma's followers started worshipping this idea of 'self-sufficiency' without critically examining its operational aspects. On the one hand, overemphasis was laid of self-supporting craft-centred education, but on the other hand the state never came forward to take over the crude products prepared by the children in the schools. This and some other reasons led to the failure of Basic Education.

The Education Commission (1964-66) introduced a new concept of 'Work Experience' as an integral part of the new edu-

cational set up. It was argued that the present education pattern emphasized academic work too much and even in that field the attainments are not appreciable. The Education Commission (1964-66) maintained that the concept of Work Experience is essentially similar to Basic Education. It may be described as a redefinition of Gandhiji's educational thinking in terms of a society launched on the road to industrialization. In providing work experience attempt should be made to link programmes realistically to technology, industrialization and the application of science to productive processes, including agriculture. This 'forward look' in Work Experience is the main thrust which differentiates Basic Education from Work Experience. The Education Commission (1964-66) defined "Work Experience" as "Participation in productive work in school, in the home, in a workshop, on a farm, in a factory or in any other productive situation".

In fact, work experience is a method of integrating education with work by bridging the gap between reflection and action, information and formation. This will make the distinction between intellectual and manual work less marked as also the social stratification based on it. It will also make the entry of youth into the world of work and employment easier. It is hoped that from higher primary stage the students will be enabled to earn while they learn. The scheme of Work Experience will ultimately increase national productivity both by helping students to develop insights into productive process and the use of science, and by generating in them the habit of hard work. Through participation in the productive situation the students will learn to economize material, to hate waste and to prefer good work. Finally, this experience will promote social and national cohesion by strengthening the links between the individual and the community, and by creating bonds of understanding between the educated persons and the illiterate masses.

The importance of working with hands while learning can not be denied. Learning by doing and living is the best form of learning. But, unfortunately we are accustomed to short cuts and, by and large, we give primary importance to the 'end' rather than the 'means' to the end. This mentality prevalent

in Indian society makes us pessimistic about the future of 'Work Experience' in our educational institutions. I am afraid it may face the same fate as the Basic Education did.

It seems that the idea of 'Work Experience', is imported from the U.S.S.R. whose political, social, economical and educational set-up is completely different from ours. As visualized by the Commission the Work Experience should be forward looking in its approach and orientation. Let us think of the cost involved in establishing workshops and equipping them with minimum requirements. The present day tendency of our schools is to completely depend on the government for financial assistance and for any change or innovation in the existing pattern. I think it would be very difficult for the government to provide the necessary men and materials to the schools for Work Experience even with bare minimums.

The list of items suggested for Work Experience by the Commission (1964-66) and the list of crafts suggested by the Secondary Education Commission (1952-53) are almost the same. Craft is a compulsory subject in the schools. The students have to pass in craft in the annual examination. If, say, in a school gardening is a craft and one period per week is allotted in the time-table for this purpose. Unfortunately, gardening would not be done throughout the session. Of course, at the time of the annual examination the craft teacher would ask each student to submit one flower pot. Accordingly, the students would manage to secure flower pots to meet the requirement of the annual examination. Same thing happens with the 'spinning' and 'weaving' crafts. At the time of examination thread purchased from the market is submitted. In fairs and exhibitions too borrowed and purchased articles are displayed in majority of the cases.

Another interesting aspect of the Commission's report regarding Work Experience is the introduction of gardening for urban schools. In this regard the commission has completely overlooked the existing condition of the urban schools so far as the accommodation and surroundings are concerned. They have bare accommodation for holding the classes, that too in double shifts. How can we think of gardening when the schools do not have even playgrounds. If we make a survey

we can easily find that any available land in the neighbourhood of the schools a decade ago is now transformed into beautiful buildings. There is no effective legal provision to prevent the diversion of land in the neighbourhood of schools for other purposes. Thus, under these circumstances it would not be possible to introduce outdoor crafts or work experience in the urban schools. Of course, paper work, leather work, chalk making and toy-making can be adopted as Work Experience in the urban schools but for these crafts too the schools need workshop and teachers trained in these trades.

In the recent past the Ishwari Bhai Patel Committee (1978) coined and circulated a new term : 'Socially useful productive work' (SUPW) in place of 'Work Experience'. SUPW is a purposeful and meaningful manual work resulting in either goods or services which are useful to the community. It is really very disappointing to note that the educationists have been simply changing the labels of the bottle of 'Basic Education' without substantially changing its contents. Mere change in the terminology will not solve our problem. What is at issue is effective implementation of the idea of linking education with life and work. It is immaterial whether one calls it Basic Education (craft) or Work Experience or socially useful Productive work. In translating this idea of SUPW into practice, again, the school would need well equipped workshops and technically trained personnel, which is a remote possibility. In the absence of such facility and direction teachers are simply repeating some portions of Home Science (First-aid, poultice, cleaning etc.) and Economics, irrespective of the grade level of the students, in the SUPW period.

The National Productivity Council (NPC) and the National Council of Educational Research and Training (NCERT) have taken steps to introduce 'productivity' as a subject. These councils have jointly prepared a productivity syllabus which will be sent to the directors of education, boards of secondary education and other concerned authorities in the States and union territories to introduce the subjects in the schools from primary level. This new addition (1979) in the school syllabus is aimed at making students understand the role of productivity in the efficient management of resources, the finite nature

of resources for economic development in the nation's progress. It also seeks, among other things, to develop a desire for a better quality of life and an aptitude for a judicious use of resources. In brief, the three major areas suggested at the school level are production and productivity, productivity and economic development and productivity improvement. This idea of productivity as a subject is in fact a culmination of the efforts initiated in 1973 to consider the need for creating a new climate of productivity in the country. The All India Council of Technical Education is also considering the introduction of 'productivity' in the curricula of colleges and technical institutes.

Now, why this new subject is introduced when SUPW is already adopted in place of Work Experience in the schools? Do we want to do the same thing under different banner? This type of frequent change in the name of the same concept creates confusion in the minds of the people and, therefore, in the absence of concrete results, they start losing faith in the educational system, and become suspicious about the innovations.

It is very obvious that without participation in the productive situation the study of productivity subject would be meaningless. The learning of theory of productivity would be as useless as receiving moral education without practicing morality. Therefore, it is desirable to stick to the idea of 'Work Experience' or 'Socially useful productive work' which demands actual participation in the productive work. So far as the three major aspects of 'productivity' as a subject are concerned these can be taken care of in 'Economics' and 'Environmental studies'.

In fact, the idea of Work Experience or Socially Useful Productive Work (SUPW) is irrelevant for the rural children. They are intimately tied to the world of work. What is urgently needed is to teach the 'philosophy of dirty hands' to the citydweller sons and daughters of white collared parents.

Microteaching : An Innovation in Teacher Education

The traditional teacher-education programme consists of theoretical courses on one hand and supervised practice teaching on the other. It is generally assumed that such a programme equips prospective teachers with the basic teaching skills and instructional techniques essential for good teaching. But, those who are engaged in the business of teacher preparation and those who are trained in this manner, very well know that the theoretical courses—to which more time is devoted—are by and large, verbal, abstract and sometimes even vague. Many a time student teachers complain that there is no correspondence between the content of these courses and actual teaching in the classroom. Conscientious teacher educators also feel the need of bridging and balancing theory and practice in professional teacher education (Raina, 1970). In developed countries, this unevenness between the macrotheoretical concern and the neglect of effective practice, is being corrected by employing the method of science (finer and finer analysis of the phenomena and events) and materials of technology.

It is an established fact that lesser attempts have been made to understand the complexities of the teaching process than the learning process (Gage, 1967). There is as yet no comprehensive theory of teaching (Adams, 1970) and no generally accepted

criteria for evaluating teacher-effectiveness. The unwarranted assumption that if we had adequate theories of learning, we would not need theories of teaching, has greatly hampered the growth of a research-based theory of teaching and the creation of an instructional technology (Buch, 1971).

Teaching is not a "mirror-image" of learning. Characteristics and influence of teacher are the crux and core of the teaching process, which have been, probably, ignored in the studies on learning. Teaching has its own ramifications and ingredients which are not generally covered under learning. "Farmers need to know something about how plants grow, and how they depend on soil, water and sunlight. So teachers need to know how children learn, and how they depend on motivation, readiness, and reinforcement. But farmers also need to know how to farm—how to till the soil, put in the seed, get rid of weeds and insects, harvest the crop, and get it to market...teachers similarly need to know how to teach—how to motivate pupils, assess their readiness, act on the assessment, present the subject, maintain discipline and shape a cognitive structure." Gage's intention here is to point out that theory should not take the form of folk-saying, proverb or slogan but it should be explicit in terms of teacher's behaviour. Theories of teaching need to explicate why teachers behave as they do, and with what effects. So, the need of the hour is not to make theory an arcane term but to articulate it to get it out in the open where it can be dissected and examined.

Microteaching

It was with this spirit and intention of a scientist that a group of teacher-education and educational research workers at Stanford University developed a new procedure called "microteaching" in 1963 in contrast to the traditional all-embracing (macroteaching) procedure. Perhaps the credit of coining this term goes to Dr. Dwight Allen who pioneered the project under the auspices of an experimental programme in teacher-education sponsored by Ford Foundation and Kettering Foundation (Shah, 1970).

(Microteaching is a systematic training system in which the latest and well known principles of learning theory have been incorporated. It is based on the teaching theory underlying programmed learning and computer-assisted instructions (Lumsdaine *et al.*, 1966). In both the procedures, it is assumed that learning is more effective if a complex skill is carefully divided and sequenced into its simple components and learned step by step before if undertaken as a whole. Other concepts of learning theory such as 'reinforcement' and 'feedback' are also adopted in the microteaching procedure.

(Microteaching procedure aims at simplifying the complexities of the regular teaching process by engaging the trainee in a scaled-down teaching situation (Allen, 1968). It is scaled-down or reduced in terms of class-size, length of class time and teaching task. The trainee teaches a small group of four to six pupils who volunteer to participate in the laboratory activities. The length of the lesson is also reduced to five or ten minutes. So far as the teaching task is concerned, emphasis is laid on practising and mastering of a specific teaching skill such as lecturing, questioning or leading a discussion; and mastering of specific teaching strategies; flexibility, instructional decision making; alternative use of specific curricula instructional materials and classroom management (Perlberg, 1970).

In microteaching procedure the planned short lesson is recorded on audio or video-tape recorder which the trainee can hear and see (if video-tape facility is available) himself immediately after the lesson. The pupils who attend the lesson are asked to fill in rating questionnaires evaluating specific aspects of the lesson. Trainee's own analysis of the lesson based on the authentic feedback from the tape together with the pupil's reaction and a supervisor's analysis and suggestions assist the trainee in restructuring the lesson, which he immediately teaches to a new group of pupils. Further assessment by the 'pupils' and the 'supervisors' lead to further improvements when he teaches again, either immediately after or several days later. This type of microteaching programme sequence is practised usually in a microteaching laboratory in a teacher-training institution, or in service training programme in regular schools.

Salient Features of Microteaching

The micro-element (systematic simplification of the complexities of the teaching process) is the most important feature of microteaching. Practising and mastering of technical skills of teaching and teaching strategies is the second important feature of microteaching. An objective, accurate and instant feedback element is the third important feature of microteaching. Lastly, microteaching provides a safe practice-ground for student teachers. A microteaching laboratory possesses all the inherent features of the real classroom. When the student teacher teaches the relevant subject matter to genuine pupils, he exhibits the typical tension of neophyte teachers but teaching being a laboratory exercise, tension is rapidly reduced and it becomes possible to focus training on the acquisition of relevant teaching skills and instructional techniques needed for pupils with diverse needs and abilities.

In the traditional teacher-education programme a "model-lesson" is arranged under the assumption that the student teacher will observe a 'model' of a good teacher and will acquire proper teaching behaviour by imitation. Whether the 'models' student teachers observe really excel in teaching and classroom management is debatable. On the other hand in microteaching procedure, a record on tape or film provides the student teacher with opportunity for a thorough study and analysis of those qualities which merit imitation and adoption.

The regular classroom teaching is full of complexities. It involves multitudes of variables difficult to control and evaluate for research. The microteaching process presents a simplified teaching situation and provides an opportunity for controlled research to a degree never possible before.

Application of Microteaching

Utility and effectiveness of microteaching procedure has been proved by several studies in U.S.A. in the field of Pre-service teacher education, In-service teacher education, Counselling, Medical education, Peace Corps personnel training, Industry, Commerce, Salesmanship, Armed forces, Psychotherapy

and Human-relations. Microteaching has also been practised successfully and effectively in Higher education, where there is little today to motivate a professor to improve his teaching. The conclusions from the projects undertaken in this field suggest that new medium and techniques have been instrumental in modifying University teaching behaviour.

In our own country a modest beginning in this direction was made by the *Central Pedagogical Institute*, Allahabad by organising an experiment in microteaching during November and December 1966. Although this experiment was not designed strictly on the lines of microteaching yet they claim that under-achievers were immensely benefited from this experiment. There was a substantial improvement in the self-expression (oral and written) of those boys who were lacking in self-expression (Tiwari, 1967). The Centre of Advanced Study in Education, Baroda has also started some work on microteaching. They (Santhanam, 1971) believe that "Interaction Analysis" technique developed by Ned A. Flanders is quite suitable for microteaching procedures. Hence they are, employing both the procedures to improve teacher's classroom behaviour. Experimentations with microteaching techniques are also going on in developing countries like Africa and South America.

Criticism

Like other innovations microteaching also has both its supporters and critics. Earl Seidman has raised the point that "much emphasis is placed on training in teaching skills which presuppose the idea that the teacher's role is to control the students and to direct the class... if we treat our interns mechanistically, how will they treat their students?" Noam Chomsky, a scientific linguist at the Massachusetts Institute of Technology, has also questioned such skinnerian type training, which is appropriate only to industrial workers who need to develop complex technical skills. Chomsky asks: "Is growing up and learning no more than the shaping of behaviour? If that is what education is all about, authoritarian figures [shaping people, then may be we don't need it." Other critics of microteaching claim that while teaching a micro-class the

teacher does not encounter the regular management problems common in larger classes. But supporters of microteaching advocate that even classroom management problems can be taught in the micro-class by stimulating specific behavioural problems.

It should be stressed here that microteaching is only an upset of teacher education programme. It does not intend to substitute the theoretical foundations in the teacher education programme. It only attempts to strike a balance between the theory and practice of teacher's training programme. Microteaching practice begins with the basic teaching skills and progressively provides the teacher with opportunities to practise and master high order skills and instructional decision making.

It should be borne in mind that howsoever excellent the innovation of microteaching may be, it should be adopted practised according to the needs and conditions of Indian teacher education system. The number of untrained teachers, the number of student teachers admitted to colleges of Education, the staff pattern, the curricular demand and the resources available in the colleges are to be taken into account. Absence of technological devices is also a deterrent to the introduction of microteaching. But the experts say that microteaching can be adopted even without technical sophistication. Microteaching procedure can be practised even without TV network or tape recorder. The 'micro' and 'laboratory' elements must be cared for. The only problem in developing countries today is to train teams of teacher educators and supervisors who will be able to introduce this innovation in their colleges and school systems.

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Microteaching and Monalisa of Integration

Teacher educators, at present, can be classified into organismic or holistic and analytic or electronist. The holistic teacher educators view teaching as the fragrance of that flower which is known as teacher. They also compare teaching with "Kissing" and argue that the moment the kissing person puts a question : "What am I doing" to himself, the bliss and pleasure is lost. They further ask : can anyone match the 'Muskan' or smile of 'Monalisa' ? A difficult question to answer. But attempts have been made by a few ladies of this world to imitate and match the smile of Monalisa. This is a good omen for the analyst teacher educators.

I think the analytical or microteaching approach of teaching is in the *adolescent stage*. There is an unprecedented growth in the body and limbs. It is emotionally unstable or unsettled and mentally indecisive. It is facing "identity-crisis". In order to find out its own place and identity in the educational world it is perhaps required to relieve itself from the following cognitive constraints :

1. Do humans learn in the manner exemplified by microteaching procedure ?

2. Does this view of learning present a concrete model of reality.
3. Is it not narrow, restricted and mechanical procedure?
4. Does this procedure not ignore the principle of continuity and structure so far as learning is concerned?
5. Do we have research evidence to tell definitely the optimal number of skills to be practised and that too in what sequence and proportion?
6. Does this procedure not suffer from classroom myopia and ignores the contextual boundaries of classroom?

My commonsense suggests that the 'first industrial revolution' in microteaching is almost over. We are on the threshold of the second revolution when and where efforts can be sincerely made to approximate microteaching to social reality of classroom teaching and learning through the consideration of aforesaid issues. It is here that the holistic and analytic teacher educators meet in their endeavour to attempt the integration of various teaching skills, which have been, perhaps, formulated without showing concern to the high inference variables (Turney, 1973).

Aggregation and segregation are natural phenomenon. Things separate as naturally as they combine. But, combination or aggregation is not merely the addition or summation of separate entities or parts. Whole (gestalt) is something more than the addition of parts. In two combinations 1 2 3 4 and $1+2+3+4$ the digits are the same but their bond or valence is distinctly different. Similarly, an orchestra is not simply an addition of musical notes produced by different instruments. In fact, it is the submersion of different musical notes into a symphony that is called an orchestra.

The process of integration can further be clarified with the help of the concept of 'groupness'. A human group is not just an aggregation of individuals. To illustrate it further, think of a person looking up whole-heartedly at the sky. Another person who happens to see him and comes closer, stands by his side and starts looking up. A third person also does the same thing. In this manner 4-5 persons get collected, all looking up at the blue sky. This collection will not form a group till

the members of the group enter into interaction. The property of 'dynamic inter-dependence' is the core and crux of integration. This is something like turning a mixture into a chemical compound.

The question of integration of teaching skills is quite complex and challenging. Accomplishment of integration require lot of practice and insight into the whole configuration of teaching. Before attempting to integrate the specific teaching skills, the atomistic conception of the act of teaching needs reorientation. The problem of contiguity, distance and order or sequence of the skills should be resolved. Which skills lend themselves easily and naturally to combine and in what ratio and proportion? Can integration of teaching skills come as naturally to the teacher as swimming to animals and flying to birds? How much of it is automatic (or effortless) and how much deliberate or effortful? Can we just divide the skills into two broad categories, like "Core/Central Skills" and "satellite skills" and concentrate on "core skills" for the purpose of integration? Do we feel the necessity of giving any training or orientation to the teachers in decision making, system-analysis or situation-analysis for effecting integration of teaching skills? A number of such questions need adequate answering before we launch upon to match the muskan of "Monalisa of integration".

Competency Based Teaching : Some Issues

The strength of an educational system must largely depend on the quality of its teachers. However, lofty the aims, however upto date and abundant the equipment, however efficient the administration ; in the absence of an efficient teacher all these will prove sterile and infructuous so far as the pupils' learning is concerned. There is a growing consciousness in public and professional quarters that the 'goodness' of an educational programme depends to a large extent, on the quality of teaching done in the classrooms (Ryans, 1960). The identification of qualified and able teaching personnel, therefore, constitutes one of the most important of all educational concerns. Producing competent teachers is another obligation of education. If competent teachers can be prepared, the likelihood of attaining desirable educational outcomes is ensured to a great extent.

What is teaching ? Teaching is an art not a science.... Teaching is not like inducing a chemical reaction, it is much more like painting a picture or composing a musical melody, or on a lower level like cultivating a garden or writing a letter. One must immerse one's heart into it, one must remember that it cannot be done by formulae or you will spoil your work and

your pupils and yourself—(Highet, 1950). Teaching involves an element of spontaneous communication between the teacher and the pupils, a form of self-expression requiring genuine creativity. The teacher in many ways respects the prototype of an artist. The artist communicates at the same time that he portrays, teaching us to see that what he portrays, in the same way that he sees it. The art of teaching lies similarly in the communication and projection of an essentially private experience.

There are no unquestioned or universally accepted definitions of good teaching. From times immemorial, educationists, philosophers and researchers have tried to define and explain 'good teachers'. Giving a very comprehensive definition, Jansen (1951) indicated that a good teacher is adaptable, attractive, careful, considerate, cooperative, dependable, enthusiastic, forceful, healthy, honest, industrious, neat, open-minded, original and progressive as well as well informed. The gradual evolution of this definition may be traced down the decades. The philosophic rationalists of the mid-nineteenth century put emphasis on strength of character, clarity of thinking, firmness of discipline, intelligence and scholarship (Sully, 1886). By the late nineteenth and early twentieth century there was more talk of tough mindedness, extraversion and gift in the management of people (Welton and Blandford, 1909). Emphasis was next put on organizing ability and on skill in the arrangement of conditions contributory to the establishment of correct habits. This was supported by a concern for clarity of analysis of the content of the curriculum, perseverance in drill and clearness in presentation (Kent, 1920). The writers of the late 1920's asked for an interest in 'citizenship'. The good teacher was one who, participating in the concerns of the community, understood the social relevance of curriculum (Mead, 1929). By the 1930's attention was turning to the significance of attitudes. A good teacher was one who showed gifts of leadership, discrimination in the assessment of seriousness of misdemeanours, along with a certain flair in the treatment of behavioural disorders, supplemented by professional skill in the use of standardized tests and the diagnosis of individual difficulties in the learning of the basic subjects (Rinsland, 1938).

In the 1940's there were signs of a fuller appreciation of the adult who showed attractiveness and persuasiveness, ability to win attention as well as command support (Jackson, 1940). Recent findings by Ryans (1951) and Evans (1952) vary from ratings in open-mindedness (in the sense of the originality, adaptability and tolerance which permit participation on the part of the pupils), a business like approach in the organization of class activities, impartiality, calmness, consistency, sociability and attractiveness, intelligence and the willingness to use it in the classroom situations, to scores in objective tests of resourcefulness, social participation and interest in teaching.

Traditionally, a teacher is considered fit to teach on successful completion of certain professional and academic courses. Today, this assumption is being questioned. In its place the idea of competency is gaining strength. A teacher is considered fit to teach only when she can successfully demonstrate the essential competencies required in performing the function of teaching. Traditional evaluation of teacher trainees comprises of rating the trainee's knowledge, in the theoretical course, usually represented by a grade obtained in the examinations held at the end of the course and appraisal of the trainee's teaching performance, typically represented by a grade given for practice teaching. The competency based movement calls for more detailed, fine grained evaluation of the skills, knowledge and attitudes of teacher trainees. The trainees are held responsible not for passing grades but for attaining a given level of competency in performing the essential tasks of teaching.

Teaching Competencies are variously defined as "...attitudes, understandings, skills and behaviours that facilitate intellectual, social, emotional and physical growth in children" (Cooper and Weber, 1973), "...functional abilities which teachers demonstrate in the day to day job related activity" (Dodi, Norman et al., 1972), "demonstrated ability to perform the functions required in a certified teaching position" (Schalock, 1973). Generally, 'Teacher Competence' is the ability of a teacher to produce agreed upon educational effects. For example, a teacher's ability to modify the behaviour of pupils when and if appropriate is a competency. The knowledge of the principles involved like 'reinforcement' is not a

competency, but the actual performance which accomplishes the end would be an evidence that the teacher possesses the competence. Also, a competent teacher must demonstrate the required competency not only in the ability to perform but be able to use the ability when it is appropriate and avoid using it when it is not.

A teacher's basic competence according to Barr (1952), imply her role as (i) director of learning (ii) a friend and counsellor of students (iii) a member of a group of professional workers (iv) a citizen participating in various community activities. Thus, we can define teacher competence as the ability to apply to practical situations, the essential principles and techniques of teaching. Reager and Pratte (1973) have given importance to four criteria for judging teacher competence : (i) knowledge of the subject to be taught, (ii) certain natural endowments such as a pleasing personality, patience, fondness for children and mental stability, (iii) knowledge about the students like the students' family background, social status, cognitive ability etc. Gage (1965), in a review of literature of the present time allows for the selection of five 'global characteristics, namely, warmth, cognitive organisation, orderliness, indirectness and problem solving ability as components of effective teaching. O'Kelley (1974) indicated that an effective teacher must have a thorough knowledge of the subject matter, show interest in teaching students and show interest and enthusiasm for the subject. According to Yarger (1974) competent teachers would be viewed as professionals who could employ specific instructional strategies based on the objectives of the materials to be taught, the situation for teaching the characteristics of the children, and finally their own characteristics of teaching style. Haberman (1965), in his intriguing and informative study of the teaching behaviour of successful teacher trainees, identified five behavioural patterns that seemed to distinguish between successful and unsuccessful teacher trainees : (i) a behavioural demonstration of a belief in the youngsters' potentialities, (ii) an ability to organize a classroom situation, (iii) a real enthusiasm for some subject matter, (iv) an ability to set appropriate standards, and (v) a willingness to listen.

One of the major problems in education today is how to

evaluate adequately the competencies required of an effective teacher. The three major obstacles reported by researchers in the area are : (i) lack of consistency regarding the precise criteria for effective teaching, (ii) consequent lack of agreement among professional educators regarding which action patterns constitute effectiveness, and (iii) reluctance on the part of teachers to submit to intensive and prolonged investigation of their professional performances.

Another problem is what priority should be given to the many things that may be evaluated ? According to McDonald (1978), the major areas of competence to be evaluated are the substantive knowledge about the content of the curricula, teaching methods, performance skills and strategies and attitudes towards teaching and learning. The logic of the argument supporting the position is that it is what the teacher does that directly affects how much children learn, develop and change as a consequence of being exposed to instruction. What a teacher knows about the subjects to be taught also determines what a child will learn, and teachers' attitudes will affect how they actually teach and how the children will learn.

Therefore, to assess a teacher's performance in relation to a given competency, many dimensions of the teaching learning process must be considered such as :

- (i) Student population : Grade, age, class size, percentage and kinds of handicaps, level of socio-economic status, absentee rates, kinds of grouping, reading level etc.
- (ii) Instructional materials : Match between curriculum purposes and materials, sufficiency of materials etc.
- (iii) Curriculum : Content/subject area, degree of teacher involvement in creating curriculum etc.
- (iv) Classroom setting : Light, space and furniture, black-board, bulletin board, book shelves etc.
- (v) Time allocation and utilization : Time allocated for each activity.
- (vi) Distractions : Nature and kinds of interruptions, noise level etc.
- (vii) Teacher : Teacher feelings of security, ability to handle

content previously taught, years of teaching, likes or dislikes of students, perceptions of their feelings etc.

Also in assessing teaching performance, certain conditions must be kept in mind like :

- (i) Teaching does not occur in a vacuum, it is one component of a holistic classroom ecology.
- (ii) Given a common instructional objective for the same student, it is possible that two teachers with contrasting styles could achieve similar results.
- (iii) Depending upon teacher's experience, training, personalities and interests, a given teaching act or competency will be more or less difficult and this in turn, will be affected by context variables.

As Tikunoff and Ward (1978) have very aptly pointed out : 'the act of teaching cannot be investigated successfully unless the total context of the teaching learning event is considered'. For this, research on teaching has of necessity to be carried out in naturalistic settings which allow events to occur realistically. This contention is supported by the work of Brophy (1976), Stallings (1976), McDonald (1976) and Tikunoff, Berliner and Rist (1975).

Another issue that complicates the evaluation of teacher competence, is the unreliability of assessment techniques based on the observation of external behaviours of teachers. These assessment techniques tend to be reductionistic and lacking in meaning because they fail to assess the underlying causes of these behaviours of teachers. Usually the result is the assessment of behaviours which have little generalizability or transferability to a variety of teaching requirements. A trainee, for example, may acquire particular skills, but never become even a moderately effective teacher. The trainee in a microteaching programme may learn how to reinforce participation in a microclass, ask higher order questions or give clear explanations. Assessment made of skills in these particular performances tell us that the teacher trainee can enact the desired performances under a set of conditions, but they do not

reveal whether the trainee can combine and integrate these skills and others into a complex strategy that can be varied from day to day and sustained over long periods of time. Managing a class, for example, occurs throughout the entire period or day, it consists of a set of skills that may be called upon for different reasons at different times. How these skills are used in day to day practice ultimately determines whether a teacher is a skillful manager.

Implicit in the behavioural objective approach is the assumption that the acquisition of microskills and abilities add up in some linear and simplistic fashion to overall competence. Statistically speaking, specific skills may be associated with teaching success, but it does not follow that these behaviours lead to success, they may have followed it. Broudy's (1972) criticism of this supposition is useful here: "The assumption that in teaching the whole is merely the sum of the parts . . . is a notoriously inadequate description of any human action, let alone one so complex as teaching. Teaching, can of course, be thought of as broken down into parts, but as a concrete action, it is guided at every moment by a sense of its total pattern. This pattern, in swimming, reading, classifying judging, integrates the analyzed constituents into a meaningful functional sequence, not merely a mechanically additive one". Broudy goes on to say that how often a person has performed a specialized task or over what range may not be as important as the ability to perform a variation of the task not previously practised.

The implications of Broudy's comments have been summarized by Pottinger (1976): 'the preoccupation with specificity, clarity and precisions of behavioural objectives has left us with an operational paradigm for defining and measuring teaching competencies which is intuitively and theoretically oversimplified and invalid Rigorous behavioural observations fail to assess adequately either complex interactions among variables or underlying causes of competent teaching performance. Too often qualities of the mind and character unamenable to direct observation techniques account for the presence or absence of competent performance.'

The alternative to the behavioural objective approach seems

to be the traditional system of evaluation which is vague, abstract and unmeasurable. However, we know that competence consists of a number of complex interacting variables which are not always directly observable. Neither the knowledge of how one should teach, nor simple demonstration of the behaviour gets to the heart of competence. Links must be established between the knowledge and behaviours that constitute successful performances and their causes. Competency assessment should include factors which cause effective use of both knowledge and behaviours in the classroom. For example, a teacher's ability to match teaching style with students' learning style is an important teacher characteristic. It would be better to define, teach, and assess the causal variables or factors that lead teachers to make such adaptations.

A holistic approach, rather than a component, competency by competency analysis of teaching, needs to be emphasized in research on teacher competence. Holistic analysis attends to the entire reality in which teaching occurs. It considers not only the quantitative occurrence of a teaching competency but also the qualitative influence upon all those involved and the implications of the competency within each particular occurrence. The stress should be on a combination of quantitative and qualitative methodologies in holistic analysis.

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Managing New Media in Education

The world is passing through a technetronic revolution. We, in India, are also feeling the impact of the tempo of technological change almost in every walk of life. It is a truism to say that Industry and Agriculture have made revolutions through the use of technological advancements. But the application of technology is at the 'dry farming' stage in the field of education in our country. We have to agree with Finn (1968) that "technology has only washed lightly on the shores of instruction".

The instructional media and teaching aids have passed through four stages. The first stage consists of pre-machine devices like charts, models, exhibits etc. The second stage includes printed or written material like text-books, reference books, work-books and teachers' notes. The third stage introduced machines like radio, linguaphone, projector, films etc.; and the fourth stage, which is coming up, depends on man-machine communication e.g., computerized instruction, language laboratories etc. Broadly speaking, the first wave of breakthrough came with the invention of paper, ink and printing, and the second wave started with the invention of photography and sound films.

Reviewing the literature on teaching devices in the *Harvard*

Educational Review (1957) Douglas Porter (1966) has pointed out that teaching efficiency might be increased by two closely related measures :

1. the application of some demonstrably valid psychological principles derived from learning experiments, and
2. the use of teaching aids and devices.

These devices can be classified as stimulus devices, response devices and stimulus-response devices. Authors of articles on immediate reinforcer teaching devices make the following claims for their devices :

1. They are time and labour saving for teachers.
2. They are effective because they provide immediate reinforcement.
3. They are more effective in consistently delivering reinforcement than a teacher can be.
4. They can deal effectively with the range of individual differences present in a classroom.
5. They are able to teach the complex relationship involved in verbal thinking (Porter, 1966).

As the task of education increases in size and complexity, two immediate effects can be noted. Firstly, a growing demand for more highly trained professional workers and second, a tendency to marshal technological resources to assist or amplify the efforts of professional workers to reduce the drain of mechanical and repetitive chores on them. Both quantitatively and qualitatively we have here a truly formidable task. Never before has any society been faced with the problem of providing so much learning to so many and with so much at stake. Never before has any society had a greater potential to train the necessary teaching force and provide teachers with such powerful tools to do their work. This is one of the greatest challenges of our time (Brown, 1965).

Modern teaching calls for integrated and highly organized use of instructional resources. But, the present educational scene is dominated by the persistence of traditional patterns of

instructional organization and practice on the one hand and the encroachment of new ideas and new technology on the other. For this reason, our uses of educational media are still uncertain and experimental, and administrative provisions for their management are tenuous, varied and changing, to say the least.

Making systematic use of the various educational media seems to suggest some examination of the total range of technological resources, and explorations of the need for coordination. Whether this would be desirable in any particular case may depend not only upon such general considerations as coordination and economy, but also upon the circumstances of the local situation, the size of the institution, the existing physical facilities, the personalities involved, and that always delicate balance of the traditional past and the emerging shape of the future. But, it is assumed that at some level of administrative planning and organization, all facets of the instructional-communications technology must be viewed as parts of a comprehensive whole.

Some questions generally asked are: Why not leave educational technology to the technicians? Why must professionally trained persons be used for this work? One answer to these questions has been given quite pointedly by Charles F. Hoban, Jr. (1962), Professor of communication at the University of Pennsylvania:

"The problem of new media in education, as with almost all of the problems of new technologies, are not those of mechanics or the machinery involved. The engineers and technicians do a reasonably good job with the mechanics and the machinery of technology. The real difficulty is much more complex. It arises from the reorganization of procedures, the introduction and wider rise of management on a higher level of skill, the changing role of the men and women in the process of system, and the evaluation of goals made possible by the productivity of technology." Dr. Shib K. Mitra (1977) also endorses this view point and stresses the need of organizational skill and management of a high order to utilize educational technology in a fruitful manner.

The problem will be solved neither by employing more administrative personnel nor by simply buying more films,

more books or more projectors. We, in fact, need an insightful recognition of the proper roles of instructional media services as required by changes in curriculum goals and patterns, the nature and size of our student group, and the teacher classroom needs.

The long-delayed advance of technology in education has entered a stage of acceleration. Increasing use of newer media in the classroom calls for many changes : new designs for school buildings, changes in the organization and scheduling of classes. Sometimes, rather drastic changes in instructional procedures, striking at the very heart of the teacher-pupil relationship, are required. Many teachers feel threatened because they believe that the technological advances tend to generate greater distance between the teacher and the taught. Shimabukuro (1964) points out that the earlier audio-visual media, including films, filmstrips, slides, recordings, display and three dimensional materials, were not so threatening because they did not disturb the central role of the teacher in the instructional dialogue. With the new instructional media, designed to teach the core of various courses, the teacher is robbed of his star role and is reduced to the ignominy of an aide.

With the growing use of technology in classroom teaching, people have started asking many questions. Will this tend to "dehumanize" the instructional process ? Will instructional technology displace or degrade the teacher ? Will it place too much emphasis upon efficiency and economy, and too little upon quality ? Will it tend to overcentralize curriculum control and weaken the social autonomy in education ? These questions are real. But, the answer is not the negation of technology or refusing its benefits but facing its dangers and taming it in such a way that it does not deprive us of our humanity. A humanized technology can, on the contrary, free the teacher from the servitude of mechanical and routine chores and amplify the force of his creative and distinctively human efforts. The aim is to help people assert more powerful, more creative and more humane roles in teaching through technology. When Mumford and Maslow talk about "humanizing" the machine, they are, perhaps, talking about humanizing people. This can be done by

bringing the use of educational technology (or machine) under the control of purposes that are informed and truly humane.

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Education and Social Change

Amongst various other things, a teacher is expected to be an agent of social change. In the past, education has had primarily a conservative function, that of transmitting a relatively unchanging culture and traditional skills to the new generation. Only in a changing society, or one seeking to change, can education play a role in the introduction of change.

Meaning of Social Change

In the popular mind everything that changes within the society constitutes 'social change', from variations in the patterns of fashion to movements in population and general scientific advance. But, social change does not merely imply a structural and functional change in the organization, norms and roles of society, it also implies a change in its cultural system, beliefs, ideals, traditions and practices.

Social change is a transforming process. The word 'process' implies the idea of continuity, and social change is certainly something that is perpetually happening, and in a variety of ways. However, nothing is said here about the quality, good or bad, of the process, it is simply a way of

describing how things happen in a society, and also the way in which people adapt to certain elements in their society, or are assimilated to certain forms of activity, or adjust themselves to specific modes of behaviour.

Factors of Social Change

Change is inevitable in life and society. In the simpler societies change has been rare and usually slow, caused by culture contact or by such disasters as wars, epidemics and famines. In a more complex society, it may be caused by internal revolution and civil strife as in Russia, by emancipation and the advent of self-government as in some of the new African states, by increased inventiveness through the discovery of something like 'atomic energy', or by the impact of a particular individual like 'Mahatma Gandhi' and 'Mao'.

Social change can be said to be caused by three main types of factors, namely, physical and biological; technological; and cultural (MacIver and Page, 1950). In any attempt to explain the causation of social change, it is possible to select one particular factor and overemphasize it. Thus, Huntington (1919, 1924) held that the determining environment of geography and climate was responsible for social change; for Karl Marx (1930), the determining factors which were of paramount importance were economic, whilst, several others have argued that technological advance is reflected in the social systems. But the more one considers the causation of social change, the more one gets involved with the complex nature of society. As Morrish (1972) has so aptly stated 'the web of social relationships which we call society is reticulated and intersected by every technical invention, every vagary of fashion or art form, every new technique of birth control and every increase of efficiency in the means of production or social control. Life is one, and the change experienced in social relationships is both cause and effect'.

Education is a conscious process of attaining self-awareness and social awareness. It tends to transform both the individual and the society through progressive manifestation of new knowledge. Education and social change are interrelated

concepts. Social change is the end product of education but at the same time social change presses upon the value trends in education to generate new concepts which are again passed on to the society.

Role of Education

In the past, education has had primarily a conservative function, of transmitting a relatively unchanging culture and traditional skills, knowledge and attitudes. In the modern industrial society, education has many roles to play :

- (i) *Preservation of the cultural heritage by transmitting it to the next generation* : Consequently, schools are expected to teach the dominant value system of the society. Education also helps the individuals to examine the heritage and to eliminate that part which is not found serviceable in the modern times.
- (ii) *Agencies of social reform or social improvement* : In post revolutionary Russia, the schools were given the task of destroying the old bourgeois values and creating new values appropriate to a socialist society. In India too great emphasis was laid on re-educating people in national consciousness after the end of British rule in 1947.
- (iii) *Encouraging innovation in the material and technological sphere* : This may involve the process of innovation itself, the training of the labour force in the new skills required by an expanding technological and industrial base and helping innovations to emerge by breaking down traditional beliefs and values by lessening the resistance to change.

Cultural Lag

Education while seeking to preserve and transmit the cultural heritage of the society must also try and ensure that as little 'cultural lag' as possible occurs within the society. This means that there must be some attempt to adjust the old

culture to new conditions in order that individuals within the society may keep up with technological change. Ogburn and Nimkoff (1960) have summed up the situation in the following words : 'When culture begins to change, the modifications do not occur evenly in all parts of the social heritage. Some parts change faster than others. When the different parts are interrelated, the varying rates of change produce a strain between the unequally moving parts. The part that is moving at the slowest rate of speed constitutes the 'cultural lag'.' Since the other parts of the culture have already changed, as a rule the most practicable method of effecting a better integration between the two parts is to make some adjustment in the part that is lagging. Modern technology is changing at a rapid rate and creating important changes, with which our social institutions have not yet kept pace. Analysis of important modern social problems, such as unemployment, poverty, family disorganization and generation gap, shows that much of our contemporary social disorganisation is due from the irregular changes of our culture.

Social Change in Relation to Education

The cultural lag is apparent in the curricula being taught in schools. To remedy this, the way in which teachers are prepared for their profession must also change. Emphasis must be placed on a social education which demands the development of an 'all round approach to the pupil'. Efforts should also be made to develop 'social insight' and 'sociological imagination' in the prospective teachers. In the 'all round approach' the intellectual progress of the pupils is regarded as of less importance, then the broadening of their horizons and interests generally, and the development of their awareness and understanding of other human beings. The present emphasis according to Manheim (1940), should no longer be upon 'instruction and learning' but rather on development of 'living'. He suggested that we must seek in education to provide a curriculum which is firmly based on the social situation of the learner, in which is involved the pattern of inherited culture, the unique content of contemporary culture

and the culture of the foreseen future. Manheim has also stressed to importance of developing a sense of common purpose between the home, the school, and the society. Considering further the problem of social change in relation to education, Manheim is of the opinion that the teachers should be educated in a way which would enable them to understand the meaning and implications of change.

Current social change indicates a vast increase in innovation and adaptability, and all forms of education must clearly have these things in view. Sir Ronald Gould (1967), has warned that mechanical and industrial changes make greater and greater demands on individuals, and education needs to pull itself together and make quite sure that it meets the needs of modern society. In a rapidly changing society, educators have to be keenly aware of change, but education must not just go along with it. Change must be evaluated, and education must encourage the right kind of innovation and help to direct it.

However, Durkheim (1952, 1956) holds a deterministic view of society. He argues that it is not the aim of education to present some picture of an ideal society to the child. Nor is it the object of the educationist to consider some ideal form of education for such a society. He further goes on to state that 'to the extent that real life increasingly takes possession of him (the child), it will come to destroy the work of the teacher. Education, therefore, can be reformed only if society itself is reformed.' Again, he observes that education is only 'the image and reflection of society', it imitates and reproduces the latter in an abbreviated form, but it does not create it. Thus, it would seem according to Durkheim that the educational system alone can change neither society nor itself.

But, how can society reform itself, except through some means, agent or institution such as education? It would seem a reasonable assumption that any nation which has a vision of some more desirable society will seek to realize that vision partly, atleast, through its educational system. Therefore, there is, and must be, an interaction between education and society. It is not just a one way process, as Durkheim appears to imply, but the institution and structure of education can in

turn, change and modify the social structure. Though, developments within education are influenced considerably by economic and technological factors, education may also influence, social and economic factors directly as a consequence of its role in the discovery and dissemination of new knowledge. The spread of education and the organization of schools may have important social consequences and value change, in society.

Education and Economic Development

There was a widespread belief in education being the main determinant of economic growth. However, it has been found that in its relationship to the occupational structure, education is likely to be a dependent rather than an independent variable. The relationship between education and economic growth is a complex one. Thus, Bowman and Anderson (1963), found little economic development in countries with less than 30 per cent literacy rate, and a literacy rate of over 90 per cent in countries with the highest per capita income, but there was no clear correlation to be found, for countries falling between the above two extremes. Hoselitz (1968), confirms that the productive aspect of education is applicable only to advanced countries like U.S.A. and Western Europe. These conditions apply only to a limited extent, if at all, to developing countries.

This, however, does not mean that education has no impact whatsoever on economic development. Indeed, there is some evidence to suggest that an educated population is an asset of considerable importance to a country anxious to catch up with a more advanced economy. Musgrave (1967), is of the opinion, that the efficiency of her educational system enabled Germany to catch up with Britain after an initially late take-off into industrialization. Dore (1965), too claims that a high literacy rate in the 1870's was an important factor in the swift development of Japan as a highly industrialized nation.

On the other hand educational expansion that outstrips occupational needs, results in educational devaluation, as is happening in India at present. But, education performs another important role by introducing the developing society to new needs, new expectations and even to the idea of change

itself. Education helps to wean the developing society away from the old, and towards the new ; it inspires a belief in progress, in efficiency, in achievement and in rationality.

Education and Democracy

The main research findings of Lipset (1960), have shown that the higher one's education, the more likely one is to believe in democratic values and support democratic practices. However, both Germany and Japan are examples of nations which had combined a high level of literacy with a totalitarian form of government. Particularly impressive is Lipset's evidence, that the working classes and the less educated tend to be more authoritarian in their attitudes and to be more likely to favour extremist political and religious groups. But, this tendency is not restricted only to working class. As Lipset himself has pointed out, 'data' from a number of countries demonstrate that classic Fascism is a movement of the propertied middle class. There is also some although by no means conclusive evidence that students in college become more liberated in their attitudes.

Thus, the influence of education upon political attitudes is much too complex. Although it may be argued, that a high literacy rate is necessary for effective participation in a democratic government, there is no guarantee that Education and democratic attitudes are necessarily related.

Education and Modernization

Modernization is essentially a process, a movement from traditional or quasi-traditional order to certain desired types of technology and associated form of social structure, value orientation, motivations and norms. It is not simply a process of imitation, or just a superficial acquisition of certain traits and elements characteristic of the more advanced countries. Their selection in a logical order and sequence, and integration into the cultural pattern in a widely ramifying manner is essential. Thus, modernization involves the emergence of

new behavioural system with certain distinctive characteristics, implying considerable value change (Dube, 1972).

Education can be a powerful instrument of modernization. Recent researches show that correlation between the levels of national income, industrialization, urbanisation, literacy, media exposure and participation in political and economic life are significant. To develop a climate of progress, attitude change is essential. Broadened mental horizon, one of the outcomes of education, permit absorption of new attitudes, on a larger scale. Also, as an instrument of instruction, education can directly teach many of the skills considered essential for the success of the programmes of modernization.

Education and Value Change

There is every indication that the educational system of Russia has not transformed a largely illiterate and traditional oriented population into both a literate and industrialized work force, it has also managed to produce a generation which is in the main ideologically committed to the social order. The schools, however, play only a minor role in the total process of indoctrination. Every agency of socialization is involved, such as the theatre, films, radio, TV, press, youth organizations etc. This is in striking contrast to most democratic systems where the various media of socialization are only loosely controlled. Democratic societies are usually pluralistic and different and even opposing systems may be transmitted by different institutions. Thus, it would appear unreasonable to expect a school system alone to achieve major changes in attitude. However, in his new classic study of 'Benington', Newcombe (1943), has shown that given the right conditions, the experience of college could change student attitudes and values.

Conclusion

The precise relationship of education to social, economic, political and cultural change can, therefore, be seen to be one of extreme complexity. The complexity is further aggravated by the fact that the educational institution is itself a part of

the society which is changing. In essence, the aim of education in the present fast changing society should be to impart to the learner the life's know-how and prepare him for change, capability, mobility, flexibility, uncertainties and emergencies.

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Continuing Education of College Teachers

George Z.F. Bereday has observed that a University is so many things besides knowledge. In A.N. Whitehead's view the justification for a university is that it preserves the connection between knowledge and zest for life, by uniting the young and the old in the imaginative consideration of learning. The University of today serves the mass instead of few, but its duty remains that of enabling human beings. He further envisages that a University is not a democracy but a republic and the professors (teachers) are the aristocracy of this academic republic.

A college (or a University) stands and falls by its professors. It is generally said that as the professors so is the college. They are the professors who really make or mar the image of a college. Therefore, they should carry themselves like professors with nobility, dignity and scholarship. Professors ought to be people put on perfection, bubbling with excitement over ideas. They should read, write and speak great thoughts. Bereday asks them to "hitch their wagon to the highest stars". In essence, they need constant insistence on quality and excellence.

There are not enough competent college and University teachers to fill most of the posts that have been created to meet the demands of mass higher education. Many of them are not

well qualified, but quite apart their level of performance is pulled down by the large numbers they have to teach. The working conditions are often poor and remunerations scanty. Edward Shils has remarked that in India, most of the teachers in institution of higher education teach many hours weekly for very small salaries, and many of them supplement their professional income by writing notes for students or by scrambling for examinership. They have little time or motive for improving their knowledge and their manner of teaching. Lipset, from the findings of Shils and Kleiner, however, suggests that colleges, with better trained and devoted teachers, experience relatively few incidents of students' indiscipline.

Quality of the citizens depends on the quality of education and the quality of education, in its turn, depends on the quality of teachers. Therefore, with poor quality of teachers it is difficult for a nation to make significant contribution to the fund of knowledge and wisdom. It is an acknowledged fact that we have been at the receiving end of the pipe, so for the modern knowledge is concerned. In this age of rapid change and resultant obsolescence, unless sincere efforts are made to update the knowledge and competence of teachers, we cannot think of setting "excellence" as an aim of University education. The Education Commission (1964-66) has rightly remarked :

"A sound programme of professional education of teachers is essential for the qualitative improvement of education. Investment in teacher education can yield very rich dividends because the financial resources required are small when measured against the resulting improvement in the education of millions."

For about fifteen years enrolment in higher education grew at the rate of 13-14 per cent per year. In no country of the world did at any point of history the rate of expansion go beyond 5-6 per cent per year. Unavoidably, therefore, we paid a heavy price in dilution of standards. Nothing else was so much responsible for low standards, says Amrik Singh, as the poor quality of teachers recruited into the system. The speed of the horse-man cannot be faster than that of the horse. Hence, what the teachers imparts to their students cannot

obviously be better than what they are capable of. To improve their professional competence is, therefore, a matter of paramount importance. Though this is recognized, what is actually being done is woefully inadequate. The UGC budget funds for quantitative expansion in the fourth plan period were fully utilized but those meant for qualitative improvement, limited as they were, lapsed to the extent of 50 per cent.

Teaching is a highly skilled profession and, therefore, training should be an essential requirement for the new entrants. A lecturer in a College or University is required to take up his full load of teaching from the first day of his appointment. He starts teaching without any orientation to methods of teaching either through a formal course or through the observation of teaching of some effective teachers. He or she simply imitates the ways of teaching of his or her teacher. The new entrant designs his lectures without giving a deeper insight into the purposeful organisation of his lecture. He lacks the proper understanding of the adolescents to whom he teaches. Neither he knows the psychology of adolescents nor the psychology of learning. He prepares question papers and assess the answer-books without receiving a scientific knowledge of evaluation techniques. He has no grounding to organize tutorials, seminars, discussions or workshops. There is no tradition, in our Universities, where a junior consults his seniors on professional matters. Nor is there a tradition under which a departmental head imparts, regularly, phased guidance to the new entrants in the profession. Thus, the enthusiastic recruit is left to himself and all the competencies, in course of time, are acquired by him through trial and elimination of error. If he gets through this ordeal without being wrecked the credit goes to himself and not to the seniors or the system.

The Education Commission (1964-66) has emphasized the need for a training course for newly recruited university and college teachers. Even for the old and senior teachers programmes of continuing education are desirable in view of the exploding knowledge and techniques in the area of education. Nearly one lakh journals in 60 languages double every 15 years.

Half of what a person learns is no longer valid when he

reaches middle age. In future skills will obsolescence and facts will wear out at a more rapid rate. No one will ever 'complete' an education. Therefore, in order to arrest professional obsolescence, one must learn continuously and develop the 'knack of learning'. The draft of national policy on education (1979) has, again, reiterated the need for professional and pedagogical preparation of college and university teachers. What John W. Gardner said in another context equally holds good for teaching profession : "The society which scorns excellence in plumbing because plumbing is a humble activity and tolerates shoddiness in philosophy because it is an exalted activity will have neither good plumbing nor good philosophy. Neither its pipes nor its theories will hold water."

Background of Doctorates

Intellectuals rightly described as the "dissenting conscience of the community" by Noam Chomsky, form the major national asset, as they contribute directly to the "creation, transmission and criticism of ideas" (Bottomore, 1964). They have an active and important role to play in the rapid modernisation of our country. Therefore, discovery, development and training of intellectual leaders who can contribute to the advancement of knowledge and learning is well recognised as an important function of modern education. An unprecedented need for increasing the number of scholars is felt in every developing nation. Doctorates and intellectuals help the nation survive and prosper, to staff swelling colleges, to expand the frontiers of knowledge, and to give direction to complex public affairs (Strauss, 1965).

Almost in every country the climax of formal academic training is the earning of doctor's degree from a University or a recognised institution of higher education. The doctorate gives the recipient, what Samuel. Strauss calls, a "learner's permit" to proceed with intellectual explorations of his own and the degree may therefore be said to serve as the mark of the scholar and the scientist who contribute to the development of knowledge.

Given the general agreement on the importance of research, it is surprising that there has been so little research on researchers. The sociology of researchers or the recipients of doctorates is not yet noted for the proliferation of its studies. Chaudhari (1967) in his theoretical speculations accuses the Indian reformers that they did not pay any attention to the social and economic basis of intellectual activities, and hardly recognised the dependence of the one on the other.

Related Research

No research has been done specifically on the background of doctorates in our country. However, a few studies have been reported on the sociocultural backgrounds of scientists and teachers. Sinha (1970) made a study of sociocultural and organisational context of professional environment of Indian scientists and found that Indian scientists predominantly come from the middle economic class and the upper Hindu caste. Compared to the factors of caste and religious community linguistic affiliation seems to play a more significant role in the selection of personnel and in the formation of cliques in the scientific organisation. The bulk of scientists respondents feel that traditional Hindu values do not act as an inhibiting factor in the growth and utilization of science. A similar study by Jaysuria (1970) on social characteristics, career, values and attitudes of Ceylonese research scientists, by and large, corroborate Sinha's finding. Gore (1970) and others report the social and educational background of 1940 college teachers selected from 36 institutions of eight states. They have examined the social characteristics, occupational life and social attitude of these college teachers.

Strauss (1965) researched high school background of 6,938 graduates who earned a doctorate in 1957 in U.S.A. Rank in graduating class and intelligence tests scores reported in standard scores. As indicated by high school records, wide differences in ability were found. In a separate study in 1965 he also examined the background of scholars to ascertain how they had made their career choices. Harmon (1961) made a study of high school background of science doctorates who

received third level research degree from Universities in the U.S.A., in 1958. This study revealed that physical scientists were highest on ability measures and school size was strongly correlated with doctorate productivity. Astin (1970) examined women who received their doctorates in 1957 and 1958, and described their career choices, work patterns, occupational achievements and rewards; home, community and leisure activities and the obstacles these women have faced in their careers.

In this study an attempt has been made to answer the following questions :

1. What are the age and sex statuses of the doctorates ?
2. What are their religious affiliations ?
3. What is their language origin ?
4. What is the social class of the doctorates ?
5. What languages do they know ?
6. What are their academic and professional statutes ?
7. What are their parents' occupations and educational achievements ?

PROCEDURE

The sample used in this study comprised of only those recipients of doctorates who were awarded Ph.D. degree by the University of Indore till December 1969. The University of Indore, Indore, Madhya Pradesh, was started in May, 1964 and it has in all ten faculties. The University had awarded Ph.D. degrees to 23 candidates in various faculties by the end of the year 1969. The distribution of the doctorates is presented yearwise and subjectwise in Table 1. Table 2 presents facultywise distribution of the doctorates.

On January 1968 convocation, the University conferred the Ph.D. on 4, and on December 1968 convocation on 5 candidates. Thus 4 candidates in the faculty of Arts, 8 in Science, 1 in commerce and 10 in the faculty of Engineering were awarded Ph.D. degree respectively. Table 1 and 2 also illustrate the actual number of respondent doctorates

TABLE 1
Yearwise and Subjectwise Distribution of Doctorates

<i>Convocation Year</i>	<i>Subject</i>	<i>Number of Conferred Doctorates</i>	<i>Number of Res- pondent Docto- rates</i>
Year 1963	Mathematics	2	1
	Chemistry	2	2
December 1968	Economics	2	2
	Zoology	2	2
	Botany	1	
	Commerce	1	1
	Physics	4	3
	Mathematics	4	4
December 1969	English	1	1
	Pol. Science	1	1
	Physics	2	2
	Statistics	1	1
Total		23	20

TABLE 2
Facultywise Distribution of Doctorates
(January 1968 to Dec. 1969)

<i>Faculty</i>	<i>Number</i>	<i>Actual Number Studied</i>
Faculty of Arts	4	4
Faculty of Science	8	6
Faculty of Commerce	1	1
Faculty of Engineering	10	9
Total	23	20

Sample

In all the sample consists of 23 doctorates but out of them only 20 responded. Out of the non-respondents one had gone abroad and two did not return the instrument.

Relevant information about age, sex, teaching experience and research experience of 20 respondent doctors is presented in Table 3 (a). The sample entirely consists of males having a mean age of 36.3 years with a range of 25 to 53 years. The mean graduate teaching experience of the sample is 11.25 years with a range of 0 to 30 years and the mean post-graduate teaching experience is 5.36 years with a range of 0 to 16 years.

TABLE 3 (a)
Demographic Characteristics of Doctorates

Sex	
Male	20
Female	—
Age	
Mean	36.3 years
Range	25-53 years
Experience	
Graduate	11.25 years, Range 0-30 years.
Post-Graduate	5.36 years, Range 0-16 years.
Research Experience	
Mean	3.5 years
Range	2 to 6 years

TABLE 3 (b)
Facultywise Average Ages of Doctorates

Faculty of Arts	41.20 years
Faculty of Commerce	35.00 „
Faculty of Science	35.20 „
Faculty of Engineering	34.33 „

The mean research experience (years taken in completing Ph.D. thesis) of the sample is 3.5 years with a range of 2 to 6 years. Facultywise average age of doctors is shown in Table 3 (b). Inter faculty comparison of the age of doctors demonstrates that the doctorates of Arts faculty are the oldest and the doctorates of Engineering faculty are the youngest.

Instrument

To study the socio-educational background of the doctorates questionnaire was circulated, in which they were asked to report their age, sex, social class, religion, language origin, languages known, academic and professional statuses and the occupation and education of their parents. They were also asked to indicate the name of countries visited and scholarships and academic awards won.

FINDINGS

Language Origin

This study reveals that all the 20 doctorates studied are Hindus and they come from the middle class of the society.

TABLE 4
Language Origins of the Doctorates

<i>Language origin</i>	<i>Number</i>
Bengali	1
Hindi	9
Marathi	4
Punjabi	2
Sindhi	2
Telugu	2
Total	20

Table 4 shows that the biggest group of the doctors is of Hindi language origin and second group is of Marathi origin. It is quite expected as Indore is predominantly a Hindi speaking city and it was the capital of the then Holkar State of Marathas.

Language Known

Table 5 presents the languages known to the doctorates from different faculties. A close observation of Table 5 indicates that Hindi and English languages are known to

TABLE 5

<i>Languages Known</i>	<i>Doctorates N-20</i>	<i>Faculty of Arts (4)</i>	<i>Faculty of Comm. (1)</i>	<i>Faculty of Science (6)</i>	<i>Faculty of Engineering (9)</i>
Hindi	20	100%	100%	100%	100%
English	20	100%	100%	100%	100%
Sanskrit	1	25%	—	—	—
Bengali	1	—	—	—	11.11%
Sindhi	2	—	—	16.66%	11.11%
Urdu	3	25%	—	16.66%	11.11%
Punjabi	3	25%	—	16.66%	11.11%
Marathi	4	—	—	33.33%	22.22%
German	3	—	—	33.33%	11.11%
Telugu	2	25%	—	16.66%	—
Bhasa Indonesia	1	25%	—	—	—

Note : Number in parenthesis presents the number of doctorates in the faculty.

all the 20 doctorates and the third most known language is Marathi. The doctorates of science faculty know the highest number of languages.

Academic Background

As indicated by Table 6 (a), no doctorate in the sample got third class at the high school, graduate and post-graduate level. 4 doctorates got first class and 16 got second class in the high school examination. 5 obtained first class and 15

TABLE 6 (a)

Academic Status of Doctorates (all Faculties Combined)

<i>Examination</i>	<i>Division Obtained</i>		
	First	Second	Third
High School	4	16	—
B.A./B.Sc./B.Com.	5	15	—
M.A./M.Sc./M.Com.	9	11	—

second class at the graduate level. 9 got first class and 11 second class at the post-graduate level.

Facultywise academic status of doctorates is presented in Table 6 (b). Interfaculty comparison of divisions is shown in Table 6 (c). Faculty of Engineering leads in academic performance in various examinations. There are 2 first classes at high school, 3 at graduate and 5 at post-graduate level. As regards the research scholarships, one was awarded in the Faculty of Science and three in the Faculty of Engineering. Two doctors, one in the Faculty of Science and the other in the Faculty of Engineering, respectively visited Czechoslovakia and Switzerland as visiting scientists.

Parental Education and Occupation

Educational achievements of the parents are presented in the Table 7 (a). 5% parents are post-graduate, 20% graduate, 10% Intermediate, 30% High School, 20% Middle, 10% Primary and 5% illiterate. All the post-graduate parents belong to

TABLE 6 (b)
Facultywise Academic Status of Doctorates

<i>Faculty</i>	<i>High School</i>			<i>Graduation</i>			<i>Post-Graduation</i>		
	<i>I</i>	<i>II</i>	<i>III</i>	<i>I</i>	<i>II</i>	<i>III</i>	<i>I</i>	<i>II</i>	<i>III</i>
Faculty of Arts (N=4)	1 (25%)	3 (75%)	—	1 (25%)	3 (75%)	—	—	4 (100%)	—
Faculty of Commerce (N=1)	—	1 (100%)	—	—	1 (100%)	—	1 (100%)	—	—
Faculty of Science (N=6)	1 (16.67%) %	5 (85.33%) %	—	1 (16.67%) %	5 (83.33%) %	— %	3 (50%) %	3 (50%) %	—
Faculty of Engineering (N=9)	2 (22.22) %	7 (77.77) %	—	3 (33.33) %	6 (66.66) %	—	5 (55.55) %	4 (44.44) %	—

TABLE 6(c)
Inter-Faculty Comparison of Divisions

Faculty	High School			Graduation			Post-Graduation		
	I	II	III	I	II	III	I	II	III
Arts	25%	18.75%	—	20%	20%	—	—	36.36%	—
Science	25%	31.25%	—	20%	33.33%	—	33.33%	27.27%	—
Commerce	—	6.25%	—	—	6.66%	—	11.11%	—	—
Engineering	50%	43.75%	—	60%	40%	—	55.55%	36.36%	—

TABLE 7 (a)

Educational Qualifications of the Fathers of Doctorates

<i>Qualifications</i>	<i>Faculty of Arts (4)</i>	<i>Faculty of Comm. (1)</i>	<i>Faculty of Science (6)</i>	<i>Faculty of Engi- neering (9)</i>	<i>Total Per- centage (20)</i>
Illiterate	25%	—	—	—	5
Primary	25%	100%	—	—	10
Middle	50%	—	—	22.22%	20
High School	—	—	33.33%	44.44%	30
Intermediate	—	—	16.66%	11.11%	10
Graduate	—	—	50%	11.11%	20
Post-Graduate	—	—	—	11.11%	5

the faculty of Engineering. All fathers of the doctorates from the Faculty of Arts and Commerce received education below High School. Father of one doctorate from the faculty of Arts is illiterate.

Table 7(b) presents the occupations of the parents of doctorates. 45% parents are clerks, 15% teachers, 15% businessmen, 10% farmers, 5% Medical Practitioners, 5% Managers and 5% Contractors. Table 7 (a) and 7 (b) indicate that the fathers of the doctors in Engineering and Science faculties are better educated and well placed. All of them are in the urban white collar jobs, which is certainly an advantage over others, so far as the pursuit of higher education is concerned.

DISCUSSIONS

This study seems to support Mannheim's (1936) viewpoint that "one of the most impressive fact about modern life is that in it, unlike preceding cultures, intellectual activity is not

TABLE 7 (b)
Occupations of the Fathers of the Doctorates

<i>Occupation</i>	<i>Faculty of Arts (4)</i>	<i>Faculty of Comm. (1)</i>	<i>Faculty of Science (6)</i>	<i>Faculty of Engineering (9)</i>	<i>Total</i>
Teaching	—	—	—	3(33.33%)	3(15%)
Medical	—	—	1(16.66%)	—	1(5%)
Managerial	—	—	—	1(11.11%)	1(5%)
Clerical	1(25%)	—	4(66.66%)	4(44.44%)	9(45%)
Farming	1(25%)	1(100%)	—	—	2(10%)
Business	2(50%)	—	—	1(11.41%)	3(15%)
Contractor	—	—	1(16.66%)	—	1(5%)

carried on exclusively by a socially rigidly defined class, such as a priesthood, but rather by a social stratum which is to a large degree unattached to any social class and which is recruited from an inclusive area of social life." Twenty doctorates of this sample come from six language groups which suggests that in the pursuit of higher learning linguistic or regional prejudice is not unduly active.

Absence of women doctorates in this sample points out that, in our country and particularly in the jurisdiction of University of Indore, higher education among women is still restricted to a privileged few. Similarly the absence of scheduled and backward class doctors corroborate the finding by Gore *et al.* (1970) and Sinha (1970) that the presence of scheduled and backward class personnel grows thinner at every successive stage of education.

The findings of this study indicate that the Engineering and Science faculty doctorates are drawn from better educated homes and perhaps with longer traditions of education than doctorates of Arts and Commerce faculties. Most of the doctorates come from homes where the father is engaged in one of the urban white-collar occupations. Only the fathers of two doctorates, one from Commerce faculty and from Arts, belong to rural occupation.

In substance, the data of this small and exploratory study suggest that the students from educated or advantaged homes have better chances of doing well in their own educational career and have therefore a better chance of being accepted in the competitive admissions to professional training programmes. Or it may mean that the better education of fathers is suggestive of better economic conditions which are likely to be determinative in the choice of professional careers (Gore *et al.*, 1970).

This being a small study of 20 doctorates out of which 9 belong to the Engineering Faculty, its findings should be interpreted with care and caution. To a great extent intellectual activity is dependent on the socio-economic conditions (Chaudhuri, 1967) of the scholar. Hence further comprehensive studies are needed to probe deeper into the socio-economic and educational background of the researchers and scholars of other Indian universities. This will help a long way in knowing

the socio-economic basis of intellectual activity as well as in developing the sociology of research and scholarship.

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Schools in Context*

Fundamental change is only possible when an institution is in sound 'organizational health'. Hoyle develops this medical metaphor by suggesting that innovations fail to 'take' because of tissue rejection by a school that lacks such organizational health. The healthy state that makes the institutionalization of innovation possible can be achieved, in Hoyle's view, by changing the role of the head so that teachers are more involved in decision making and by instituting greater collaboration amongst teachers, who must also develop 'extended professionalism' to see their work in wider educational context.

The book '*Schools in Context*' presents the diagnosis of 'organizational health' of schools of Rajasthan and Gujarat. It is an outcome of Dr. Sharma's sustained work on organizational climate of schools and problem of leadership. This book is divided into two sections, one by the author himself, and the other (two guest chapters) by A. Bruce McKay and Gyan P. Gupta.

In the first chapter the author has focussed his attention

* Review of the book : *Schools in Context* by Motilal Sharma, Ambala Cantt. : The Indian Publishers, 1979.

on the school as a social system. Here he has extensively reviewed the literature to bring out the meaning of 'organization' and 'social system'. The latter half of this chapter is devoted to elaborating the idea of 'school as a social system' and to the 'changing concept of educational administration'.

The second chapter deals with the studies done by the author in the area of school climate (environment). He appears to be influenced by Bloom's (1968) view that the environment is a shaping and reinforcing force which acts on the individual. Having defined 'organizational climate' he proceeds to discuss the various approaches of measuring the organizational climate. In the section on 'exploration in school environment' (chapter II) he has classified the explorations under four headings, namely, (1) Organizational climate of government and private schools, (2) Organizational climate of tribal schools, (3) Secondary schools of Rajasthan and Gujarat, and (4) School climate scores and other variables: some relationship studies.

A comparison of the organizational climate of 34 government schools and 21 private schools has been made. No significant differences were found between the organizational climate of private and government schools. Staff-members of a large number of girls' secondary schools perceived the climate of their schools as 'controlled' as compared to the boys' secondary schools. 'Closed' climate type was the most frequently perceived climate which was followed by 'open' then by 'controlled' climate types. Thus, the author concluded that the schools studied in Rajasthan stand on the two extreme ends of the continuum of the climates. The headmasters in these two contrasted groups mostly behave in the same way i.e., they provided the groups with the same leadership. Morale was found to be high in government secondary schools. The study showed that the organizational climate is significantly related to the students' achievements. 'Open' and 'autonomous' climates are the most favourable climates in this respect while 'closed' climate has adverse effect on students' achievement.

As regards the organizational climate of schools in the states of Rajasthan and Gujarat the author reported that Gujarat

schools are more open and less autonomous than Rajasthan schools. Closed climate was found occurring frequently followed by open and controlled climate respectively in both the sets of schools. The notable finding of this study was that the behaviour of the leader (headmaster) in the Rajasthan schools was highly task-oriented but moderately considerate which made their faculty members to feel both high social need-satisfaction and job-satisfaction which resulted in high morale of the staff-members. In case of schools of Gujarat 'disengagement' element was operating. Probably, this made the leader to behave impersonally.

So far as the relationship of school climate scores and other variables is concerned, it was found that no relationship existed between length of service of the headmaster and the organizational climate of the school. Increase in faculty size also increases 'disengagement' among the staff-members. It was also revealed that longer the faculty-members stay at the school, lower would be the intensity of alienation. 'Teacher satisfaction' and 'headmaster effectiveness' it was demonstrated have significant relationship with school climate.

In the study of 95 schools of Rajasthan the author found that 'paternal climate' was the most frequently perceived climate type followed by 'controlled' and 'autonomous' climates. Familiar climate took the third place. The schools of Jaipur, Gangsagar and Bhilwada districts were perceived tending more towards 'open climate' whereas schools of Ajmer, Jhunjhunu, Bikaner, Churu and Udaipur districts were perceived to be more closed. In Udaipur and Kota range 'autonomous' climate was perceived most frequently by the teachers.

In conclusion, Dr. Sharma says that the trend of climate prevailing in Rajasthan schools is, by and large, not conducive to higher achievement.

The results of regression analysis led the author to say that teacher satisfaction, faculty experience and headmaster's 'initiating in-structure behaviour' are the significant predictors of school climate.

Mckay's study examines the behaviour of school principals and teachers in relation to educational environment in selected elementary schools of the U.S.A. The findings reported

provide quantitative support for the use of aides, clerks and other para professional personnel to assist teachers in their work. In addition, educators should severely reduce the practice of assigning teachers to such extra-duties as supervision of cafeteria and playgrounds, collecting money, milk and the like. This finding has to be taken very cautiously looking to the conditions of Indian society. But, this perhaps suggests that the job environment should provide sufficient opportunities for employees to feel task-accomplishment and self-work. As far as possible, unnecessary busy-work should not be assigned to the teachers to create an undesirable environment.

In the last chapter Dr. Gupta's study on leadership behaviour and school climate is presented. In this study of 100 schools Dr. Gupta again found that the behaviour of the headmaster plays a significant role in creating congenial climate in the school. A significant positive relationships between school climate and the twelve dimensions of leadership behaviour description questionnaire (LBDQ) was found.

On the whole, the studies described in the book confirm that our educational institutions are, perhaps, over administered and underled. Therefore, administrators as well as teachers must be trained to move their schools towards 'open climate' to ensure pupils' gains and teachers' professional growth.

Agreed, the idea of 'organizational climate' is excellent, yet we must be very much realistic in our approach so far as the measurement of the climate (or environment) is concerned. Culturally and temperamentally our headmasters and teachers are very much different from their counterparts in America or England. Hence, we should first identify the better or model institution (schools) and then try to isolate the components which contribute to the creation of a desirable climate. On the basis of this (observation and analysis of indigenous institutions) we should develop norms and tools to assess the organizational climate of schools. Probably, in Indian context, looking to the "chalta hai" attitude of the teachers and scarce resources available, we cannot afford the luxury of total openness. Perhaps, openness mixed with reasonable restric-

tion would be an ideal thing for us. Had there been no printing mistakes, the value of the book would have been greatly increased. It is sincerely hoped that the book would be free from the havoc played by the printer's devil, in the next edition. In essence, Dr. Sharma's book *Schools in Context* is a valuable addition to the sparse literature on educational administration and management in India.

Development of the Creative Individual*

The old myth that creativity is the function of superior genes and talent will come out has been exploded. (Now the researchers and theorists have established that every individual is creative in a greater or lesser degree and that the development of creativity cannot be left to chance) (Torance, 1967). Creativity is not a rare experience accessible only to genius. (It is a natural and indeed an inevitable outcome of an intelligent mind when functioning in conditions of desirable mental health. Every inward (preconscious) state has an inherent tendency to form, to create, but it lies supine until revitalized and expressed by the attention of the conscious mind (Gowan, 1972). This departure from the old assumptions has led to the proliferation of research and speculations in the realm of creativity.

In spite of the fact that the area of mental functioning symbolized by creativity has been intensively and extensively explored by the researchers and of late, there has been a bibliographic explosion and some sort of hyperactivity as well, but still "is not noted for its conceptional clarity" (Parsons, 1971). In view of this observation, fresh explorations and writings are

* Review of the book : *Development of the Creative Individual* by John C. Gowan. California : Robert R. Knapp, 1972.

a welcome addition to the literature on creativity and creative functioning.

John C. Gowan's book : "Development of the Creative Individuals" presents an excellent collation of thoughts. It is an almanac of focussed intellect on 'creativity' and 'self-actualization' for the evolution of a 'superior man'. He has intelligently drawn useful material from various sources to explicate and illumine the mystery surrounding the questions : What accounts for the creativity development of superior individuals ? and how can creativity of an individual be fostered ? This is really, as has been claimed in the preface, "a book of glimpses; glimpses of theory, glimpses of practice and glimpses of a better future."

Based on the author's previous research and writing, this new work is an ambitious linking of developmental theory to the psychology of creativity. The plan of the book is to scrutinize the process of individual development, with special attention to the development of the superior individual and to attempt to justify the inclusion of creative production as a process in that developmental escalation. This developmental direction as Piaget noted is, away from the egocentric, towards greater freedom and self-actualization.

This book is comprised of seven chapters. The first, an introductory chapter presents a selective review of literature on development, mental functioning and creativity. This search of literature is confined mainly to five subdivisions on a parameter which goes along a continuum from rational problem solving to irrational psychedelia. The author, in this chapter, seems to subscribe to Hallman's (1963) comprehensive definition of the creative act :

("...the creative act can be analysed into five major components : (1) it is a whole act, a unitary instance of behaviour; (2) it terminates in the production of objects or of form of living which are distinctive; (3) it evolves out of certain mental processes; (4) it co-varies with specific personality transformations; and (5) it occurs within a particular kind of environment.")

In chapter 2 the existence and periodicity of eight developmental stages (Eriksonian and Piagetian) is described and

conditions necessary for creativity are outlined. Chapter 3 is devoted to the important concept of 'escalation'. Escalation, here means raising the level of action by discrete jumps. It embraces five different, although interrelated, aspects of development : succession, discontinuity, emergence, differentiation and integration.

Chapter 4 discusses 'Creativity' and particularly its preconscious sources in relation to developmental stages. The author asserts that creativity is the outcome of the proper functioning of development or 'unfoldment'. He defines creativity in the words of Fromm as "a means to be born before one dies." Further, he quotes Maslow and says that the amount of creativity, other things being equal, is a barometer of one's mental health. It is as natural to express creativity under conditions of high mental health as it is for a heated black object to radiate electromagnetic waves. In this chapter the author heavily draws upon the writing of Bruner, Rank and Kubie and summarises that during the third developmental stage (the initiative period), significant processes occur within the developing child as he is confronted with the following tasks :

- (a) The child learns whether to defend or cope (Bruner).
- (b) The child learns the symbolic representation of experience (Bruner).
- (c) The child moves along the continuum from adopted to creative through conflicted growth (Rank).
- (d) The child "establishes his preconscious" (Kubie) and learns to operate the creativity cycle.

This chapter also highlights the importance of 'play' as an avenue to the preconscious and discusses the tripartite division of the psyche by Freud, Sullivan, etc.

Chapter 5 is concerned with the environmental stimulation necessary for creativity at every level; Preprimary to University. In this chapter the author discusses parental stimulation of creativity facilitating child's creativity through mental health and social relationship, teacher and counsellor stimulation, environmental stimulation of youth in universities and adult

stimulation, especially travel. The processes of 'foetalization' and 'feminization' (including feminization in Gandhiji's life) have also been outlined.

Chapter 6 adumbrates the problems and penalties of remaining non-creative. These range from complete immobilization and psychosis to the lotus-land happiness of the merely uncreative. The author underlines the fact that the guidance of the past as well as all psychotherapy, has been mainly concerned with the eradication of psychopathology, the mental health programme of the future should be focussed more on developing the full potential of the individual to the self-actualization of the last adult developmental stages (Intimacy, Generativity and Ego integrity). Hence there is a need of metaguidance, not to solve crisis situations but to aid in the developmental process for full adulthood.

Chapter 7, the mansion of self-actualization, is devoted to the process of 'self-actualization' as it relates to the last three adult cognitive stages of creativity, psychedelia (mind expanding) and illumination. According to Maslow, self-actualization is the act of manifesting the capacities for which one has the potentiality. Self-actualization is an unusual process which happens to a few human beings at certain times in their lives. In regard to psychedelia the author says that the psychedelic is just now being described in the literature of mysticism. The eighth stage is still an unknown territory. About the cognitive process of the final stage we can say very little at present. Those processes which are occasional and transitory in the psychedelic period become habitual and fixed in the eighth stage, and thus the doors or barriers between the conscious and preconscious are done away with almost entirely. This stage or process may be referred to as 'integral' since the person is truly "whole" or "holy". In the end, the author has described psychomotor, physiological, religious, mystic, hypnotic and cognitive, technique for facilitating self-actualization. Creativity is the first level of self-actualization and it is here that we must start. Creativity is not so much the having of good ideas as the process of nurturing them. Gowan says that most of us are like some unfortunate women who find it easy to conceive but hard to carry to term. We continually get ideas but we continually

abort them. Often this is because the creative idea does not occur in a proper or "evening dress" form. (Like most things just born, it needs to be nurtured, loved and cleaned up.)

There are two special features of the book. One is the exclusive use of analogies from physical sciences. This is, perhaps, because the images of physical science are so clear, discrete and better organized at the present time than behavioural science. Second is extensive use of poetry. This action has been in the nature of a 'happening' rather than by deliberate design. The poet is a prophet and, therefore, very often new innovations are first announced implicitly in poetry long before they are adduced by psychological investigation. In fact, the use of poetry has helped in giving vitality and clarity to the text.

In essence, this is valuable book for the teachers, students and researchers. Probably, it will not interest the laymen. In general, to some readers it will serve as a counterpart to Reich's *The Greening of America* as seen from the standpoint of developmental psychology. For others it will represent a compendium of developmental process in superior and creative individuals. And for still other it will become a sound psychological approach to creativity and self-actualization.

Sociology of Education*

As back as 1902, Emile Durkheim observed : "the prime postulate of all pedagogical speculation that education is essentially a social thing in its origin as in its functions, and that, therefore pedagogy depends on sociology more closely than any other science." Despite this emphatic assertion there is often a failure to see the educational process as a whole in relation to society. In the book under review, Dr. Swift attempts to do this for the students. His discussion is set within a specifically sociological frame of reference, progressing from a discussion of the development of this framework (in first two chapters), through one of, 'the school as an organisation' to the social environment surrounding the school and finally to a consideration of some of the basic issues concerning the functions of education for society.

In all, there are five chapters neatly subdivided into principal sociological concepts. In the first chapter, Dr. Swift, citing Taylor (1967), draws out the distinction between 'Educational Sociology' and 'Sociology of Education' : Former is "hortatory rather than empirical, inspirational rather than objective, and

* Review of the book : *Sociology of Education* by D.F. Swift, London : Routledge and Kegan Paul, 1969.

synoptic rather than analytic." Thus, Swift and Taylor seem to be quite close to Gordon (1963) in their concept of relatively new field of 'Sociology of Education', who terms it as the "scientific analysis of the social processes and patterns in educational system."

Dr. Swift is of the view that the relation of education to sociology is the same as that of technology to the pure science. As far as the sociologist is concerned, education is something which takes place in society because of three basic facts about the human race. Firstly, everything which comprises the way of life of a society or group of people is learned. Secondly, the human infant is incredibly receptive to experience. And, thirdly, this infant is also totally dependent from birth, and for a very long period thereafter, upon other people. The process of education links these three facts together

In the second chapter the author terms 'culture' as the human building ability of society and elaborates it as : "a set of shared symbols and definitions together with the patterns of behaviour and the material products which they stimulate the people to produce." Man not only makes the culture but culture also makes the man. In one sense, then, the world of man is a symbolic creation of his culture. Dr. Swift Joins Bram (1955) to say : "immersion in verbal (as well as non-verbal) symbolism has already alienated man from nature.....with the expansion of life, we are being increasingly removed from our primary (natural) physical environment and conditioned to functioning with an entirely man made secondary world of factory whistles, telephone bells, machine control boards, traffic signals, and condensed verbal messages. We are also becoming used to facing human problems outside their flesh and blood context, but instead in terms of legal, political, economic and psychiatric frame of reference. In a sense, man is not at home today in the once familiar world of ordinary physical events : the immediacy of his existence has been sacrificed to the artificial and the intricacies of the symbolic process."

He concludes this chapter with the remark that 'education is the creation of talent' and a process of economic and social development is a process of creating ability. The education

system is only one setting for the development of self-concept, valued aims, achievement motivation and cognitive skills. Demand made upon people in the family, and at work, are also vital.

Third chapter bears the title : 'The School' wherein the author envisages that the kind of social relationships required by bureaucracy have become essential to the maintenance of society. If we have to find a single term to describe the likely development of education in the future, it will probably be increased bureaucratisation. School is a formal organisation but a special characteristic distinguishes it from other kinds of deliberately constructed organisations—it processes people rather than things. The human apparatus in the game of education responds to how it is being handled and the goods of the activity are apt to be shifting and indeterminate.

Dr. Swift puts a model of the school as a social process in which all members are constantly evaluating each others actions and modifying their behaviours accordingly. Such a model has been chosen because it provides a link between two other models—that of formal structure and that of self-concept development. He infers that the school is a social establishment with a culture of its own. It is specifically required to pay attention to its own normative and behavioural system. That is, if we think of pupils as part of the establishment rather than its clients, what in other establishments would be the means of achieving ends are actual the ends. The school, therefore, is a living organism to which individuals must adapt while coping with environmental pressures. In the process it is receptive to change from within and without. Stability is maintained through standards and their influence upon personality, but it is a kind of mobile stability which makes it part of changing society as well as a contributor to the change.

In the fourth chapter : 'the sociological environment of the institution of education,' Dr. Swift discusses the socio-cultural environment, the demographic environment, the administrative environment of the school and the socializing groups—family, social class and the peer group. In the last chapter : 'the social functions of Education,' he emphasizes that education makes its contribution to social cohesion through the formation of the

'basic personality' or ideologically, through the inculcation of an appropriate set of common values, and building consensus. He believes that for education to have a chance to become a 'prime-mover' in social change it needs to be widespread throughout the population persistent in influencing the individual and it must be linked with the occupational structure in a more than subordinate fashion. In India, we can happily share this particular view of Dr. Swift to make our educational planning and practice more functional, culture-constricted and suited to social change.

Finally, Dr. Swift discusses the functions of the educational system. Schooling and social mobility, educational selection, labour force preparation, meritocratic selection and social class selection are the major themes of his discussion. He returns to his initial thesis to reinforce that educated people are the most important capital formation. The concept of 'meritocratic selection' implies that access to the most important, most prestigious and best paid occupations in society should be reserved for the most intelligent. The social class selection function of education runs counter to the democratic creed, because it preserves and perpetuates class system by reserving particular kinds of schools for children from particular sector of the population who are then given special access to the occupational structure and leading roles on the basis of having attended these schools.

In summary, the reviewer feels that the book is free from lazy assumptions and lame ideas. Dr. Swift's descriptions are not like trying to solve problems of astronomy with astrology or problem of chemistry with alchemy. On the contrary, there is more of profundity than prolixity, revelation than repetition. We are graced in this book with 'sociological wisdom' and 'sociological imagination' relevant to the processes and patterns of contemporary educational system. The book is valuable for students and teachers from both sociological and anthropological points of view.

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Adult Education : Concept and Method

Introductions

One of the major blind spots that results from the equation of education with schooling is the presumption that only those who are identified as "students" are learning. This excludes most people for most of their lives. The result is that *education as a "social good" is crudely maldistributed*. Although the distribution of economic wealth remains the primordial problem of most societies, there is an increasing awareness that the general problem of distribution includes more than simply wealth. It is important that other varieties of goods be distributed with maximum degree of equity. Leisure, pleasure, health, information and education are, increasingly viewed as goods on which every [member of a society has a claim (Grandstaff, 1974). Indeed, distribution of non-economic goods is seen as a prerequisite of the achievement of economic equity. This analysis and thinking has led to the assumption that the efficacy of education as an instrument for betterment is an article of our contemporary faith. And, "adult education" is an indispensable strategy for the pursuit of development goals.

If development is to be viewed in social as well a economic

terms, then the planning of the adult education programme must be examined in terms of its implications with respect to the following four major areas :

1. The degree to which the programme assists adults to become aware of forces influencing their lives and to regard themselves, as active participants in selecting methods of change and, as masters of themselves ;
2. The extent to which a programme lessens or creates inequity in terms of economic and socio-cultural opportunities ;
3. The impact of a particular programme on the traditional social structure ; and
4. The ability of the programme to increase economic productivity.

Concept

Adult education is neither an "inferior education" nor an "ad hoc" or "extra" or "compensatory" education. It has rightly been underlined in the U.G.C. guidelines that adult education should not be looked upon merely as a welfare activity for the deprived social groups, but as a process of interaction with the society leading to valuable learning experiences and as a means for making higher education relevant to the needs of the society, and oriented towards a solution of existing problems.

Adult education is not the substitution of any form or stage of education, but the integration of all forms and residences of education into a more comprehensive and unified view of learning and its relationship to human action and aspiration. It is, therefore, not only a collective concept for the various branches of educational studies, but also an area of research with its own scientific sets of questions. The science of adult education has arisen not only from specialization but also from the integrating of all sciences, that is, from the need for cooperation between all disciplines. It is dependent to a still greater degree than school education on cooperation with neighbouring disciplines. This drive towards inter-discipli-

nary research arises from the object of research itself, the learning adult. While the young person at school is still to some extent, in an "educationally protected environment" even though the "educational backwater" has become an anachronism. An institution for adult education has to take into consideration far wider psychological, sociological, political, economic and medical implications (Siebert, 1975). In essence, adult education (or Androgogy) is functional, life coping, polyvalent and permanent education (education permanente). In Paulo Freire's words it can briefly be described as "cultural action for freedom".

Translated into practice, adult education aims at developing individual's mental equipment, communicative power and technical and vocational capacities. Thus, the adult education programme has the following three main dimensions :

1. Literacy (Reading+Writing), numeracy and techneracy (technical know-how);
2. Job-efficiency or skill-proficiency ; and
3. General, awareness of the environmental reality (social, cultural, economic and political reality) around them. It includes the awareness of the problems of population, pollution, nutrition and exploitation which affect the quality of life.

Method

Researches have shown that the ability to learn does not depend upon age as much as it does upon native capacity, interest, energy, time and conditions of learning. An adult learns more quickly because he has many experiences, his mind has been sharpened by use, he can reason, use logic and apply what he learns. Adults between the ages of 25 to 40 years, learn to read quicker than those between the age of 5 and 15 years. Those between 16 and 25 come second in the rate of learning. Those over 40 years old learn at the same rate as those between 5 and 15 years (Tripathi, 1970).

Psychologists Paul Baltes and Werner Schaie of the United States (Hall, 1978) have found that, far from declining,

verbal skills like word comprehension and use are better at 65 than they were at 40. The intellectual tasks that require visual skill—such as finding a simple figure hidden within a complex one—continue to improve into old age. Older adults retain their flexibility and shift from one way of thinking to another as well as they did in their prime. Only their speed appears to be affected. But given time, they can succeed at any intellectual task as well as the youthful.

The old can learn as well as the young. Some can even master a new language, a feat that has been considered the province of the young. The difference between old and young appears to be that, with age, motivation becomes paramount. Old people learn more slowly and they learn only things that appear meaningful. If they judge something to be irrelevant, trivial or meaningless, they either cannot learn it or simply will not.

Adults must be adequately challenged in the context of their lives and professions, then they will in general be no less capable of learning or ready to learn than young people. Their intelligence, their competence and readiness to learn are, however, differently structured. They often have different reference points and focal points which are linked to real life practice and individual situations, for which open learning must offer the appropriate possibilities for them to start and further their learning (Dohmen, 1977).

Adult illiterates are pre-moulded, utilitarian and generally lack the positive attitude towards change and innovation. They are survival-minded and, often, have low economic horizon. They have their own style of life and cultural and religious values. Adult learning is voluntary, that is, based on the interest of the people. Hence, their motivation for learning must find connection with real practice, personal situation and socio-economic benefits. This also presupposes communication in their own idiom and expression, and sensitivity to their sociocultural issues. Having acquired the knowledge of their "life space", it becomes easier to start a dialogue with them.

Adult illiterates are very much status-conscious and sensitive to their self-respects. They have also strong likes and dislikes.

Hence, they resent the formal, rigid and authoritarian approach of teaching. Group work, team work and dialogue (or conversation) are regarded as the *sine-qua-non* of methodology of adult education and the lecture is given different significance, namely, that of a lead-up conversation. These days dialogue is preferred, not because of any fashion or fad in method, but because of a definite anthropological awareness. The anthropology of the adult person, as indeed anthropology in general, is nowadays identical with dialogue to a considerable extent.

The group of adult learners must not be misunderstood as a kind of small class in which the relationship between teachers and learners is reduced to giving out and giving in. "Learning" here should be understood in a broader sense as the reception and mental adaptation of impressions, information, and experience in leading to an extension, deepening and change of knowledge, concepts, attitudes and behaviour of the learner. Continuous learning in this general context is an absolute necessity.

According to Paulo Freire adult education should be viewed as a liberating practice in which the educator must "die" as exclusive educator of the educatee in order to be "born" again as educatee of the educatee. This is a continual passage back and forth, a humble, creative movement, which both have to make. We must be drawing a completely false picture of learning in groups if we paid attention only to the yield in terms of factual acquisition of learning results committed to memory. We must also pay attention to the psycho-social processes, to individual and group effort, to cooperation and competition, to tendencies to isolate individuals as well as to communication and cooperation, to the whole gamut of moods and temperaments, in a word to "group dynamics," to inner movements in the social formation known as the group. These psycho-social processes are not merely a concomitant phenomenon of learning; they are its very centre (Poggeler, 1977).

The "academic style" of the teacher imparting knowledge to the adults differs, not absolutely but in degrees, from one teaching the University or College students. It is free from the cipher-like abbreviations, technical terms and use of precise

definitions. There is no place for scroll of references to the literature, analogies, scholastic controversies, references to scientific theories and aspects of historical dogmas. Schulenberg (1976) calls this approach a "method of reduction". In this approach or method before one treats a particular subject scientifically in an adult education course it is first necessary to elaborate as accurately as possible the materially decisive connections of the subject. Intelligibility, lucidity and scientific accuracy are optimally combined. The teacher engaged in adult education, will select what he hopes will be of direct assistance in clarifying the essential part and, in doing so, he should think of the motivation resulting from the mode of life of his listeners.

Conclusion

In summary, the adult educator assumes a fundamental superiority neither by virtue of age and experience nor of education. It is also not a differential of maturity which authorizes his role as "educator" but only a partial "knowledge differential", a specific expertise. The adult education workers, therefore, are required to possess the "5 Ps", that is, in their dialogue with the adults they should be polite, patient, practical, persuasive and praising. Besides this, the workers should also use "3 Rs". That is, they should be *realistic* in talking with the adult illiterates; the narration should be directly *related* to the life situations of the learners and, the message contained in the narration should be *repeated* to promote overlearning. The adult educators should always keep in mind that all imparting of knowledge is intended to promote clearer thinking, better founded judgements and saner action.

Adult education workers, no doubt, form an "army of culture". They should work with Krupskaya's devotion considering the national resolution on adult education as Lenin's decree. They also need the immense patience of "Young Communist League", who were scalded with boiling water and even dogs were set on them; but they never retreated from the front where the battle was pitched against illiteracy and ignorance.

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The Indian Mind

India is an experience, an idea and an ideal, many things to many people. It is distinctive for its antiquity and continuity. Apart from its own vitality, the continuity of India is largely due to its ability to adapt to alien ideas without losing its own identity. Her constant contact with the outside world also gave India the opportunity to contribute to other civilizations.

Every country has its own uniqueness and individuality which is mirrored in its academic, social and cultural life and pursuits. This can be termed as its 'mind' or 'collective consciousness' which determines attitudes and directs the gesture of its people. While India never lost sight of the necessity of the material and intellectual aspect of life, she laid a particular emphasis on the moral and spiritual aspect. This spiritual dimension was non-existent in other countries until two thousand years ago, and then it developed only as an adjunct of religious dogmatism attached to a particular prophet, and his set of religious tenets.

Spiritualism in India meant a dedication of one's life to the perfection of soul or self-realization of all the countries of the world, India alone, with all the hypocrisy and cant attributed to it by some foreign and even Indian writers, justifiably or

took an integral and all comprehensive view of life and existence. The great idealistic tradition of the West and the christian ideal of love and social service found expression in their writings. Unlike the 19th century reformers, the 20th century thinkers have made tremendous impact on the entire Indian Society. It is fast shedding its rigidity, 'holier than thou' attitude and traditional approach to deliverence. Tagore has beautifully expressed this in his own poetic style :

"Deliverence is not for me in renunciation. I feel the embrace of freedom in a thousand bonds of delight."

Those Indian writers who have settled abroad have, by and large, painted a dark, gloomy and negative picture of India. To V.S. Naipaul India is wounded beyond recovery. Indians have stunted ego and they are incapable of creative work. This is too pessimistic a portrayal of Indian mind. Khushwant Singh is forthright in his comment that Naipaul's book : *India—A Wounded Civilization* presents a totally negative picture of the country and the illustrations have been so chosen as to fit into his preconceived notions of India. Foreign Indian writers don't visit India for decades during which India acquires a very different landscape (Kohli, 1982). Therefore, their writings remain superficial and unreal. Because of their outmoded knowledge they fail to address themselves to the major and vital issues India is facing today. India may be a wounded civilization but it has immense power of resistance and recovery.

"The utmost creed of India", says Tagore, "is to find the one in the many, unity in diversity. India does not admit difference to be a conflict, nor does she espy an enemy in every stranger. So she repels none, destroys none, and strives to find a place for all in a vast social order. She acknowledges every path and recognizes greatness whenever she finds it. Since India has this genius for unification, we do not have to fear imaginary enemies. We may look forward to our own expansion as the final result of each new struggle. Hindu and Buddhist, Muslim and Christian shall not die fighting on Indian soil. Here they will find harmony."

Thus, the Indian people have an enormous sense of accommodation and co-existence.

The spirit of modern India is something like the spirit of nature itself. It is ever new, constantly changing, yet old. While Indians are actively engaged in their pursuits of scientific achievement, the vedas and Upanishads will continue to fascinate and inspire them. Their search for the ultimate continues without losing interest in the mundane pursuits. Meanwhile, they will bear the weight of poverty with their characteristic quietness and contentment. Mahatma Gandhi's concept of 'Ram Rajya' will always lure and inspire them more than the Marx's 'dialectical materialism'. And, perhaps, their means will be as important as their ends. Yet, what India represents today is the emergence of new 'Sarvodaya Civilization', not merely the continuation of the old 'Varanashram Dharma'. The famous philosopher and historian Arnold Toynbee is quite reasonable in his assertion that "at this supremely dangerous moment in human history, the only way of salvation for mankind is an Indian way. Here we have the attitude and the spirit that can make it possible for human race to grow together into a single family and in this atomic age this is the only alternative to destroying ourselves."

Imagination cannot be measured by the meter or weighed by the Kilogram, and then delivered to the students by members of the faculty. It can only be communicated by a faculty whose members themselves wear their learning with imagination. The whole art in the organization of a university is the provision of a faculty whose learning is lighted up with imagination. This is the 'problem of problems' in university education. Unless we are careful the recent vast explosion of universities in number of students and in variety of activities, of which we are so justly proud, will fail in producing proper results, by mishandling of this problem.

The combination of learning and imagination normally requires some leisure, freedom from restraint, freedom from harassing worries, some variety of experiences, and the stimulation of other mind diverse in opinion and diverse in equipment. Also, there is required the excitement of curiosity and the self-confidence derived from pride in the achievements of the surrounding society in procuring the advance of knowledge. Imagination cannot be acquired once and for all, and then kept indefinitely in an ice box to be produced periodically in stated quantities. The learned and imaginative life is a way of living, and is not an article of commerce.

It is in respect to the provision and utilization of these conditions for an efficient faculty that the two functions of education and research meet together in a university. If we want our teachers to be imaginative, then, encourage them to research. If we want our researchers to be imaginative, then bring them into intellectual sympathy with the young at the most eager, imaginative period of life when intellects are just entering upon their mature discipline.

Professors ought to be people put on perfection, bubbling with excitement for ideas. They should try to hitch their wagon to the highest stars. The faculty should be a band of scholars, stimulating each other, and freely determining their various activities. The whole point of a university, on its educational side, is to bring the young under the intellectual influence of a band of imaginative scholars. There can be no escape from proper attention to the conditions which, as experience has shown, will produce such a band.

The proper function of a university is the imaginative acquisition of knowledge. Imagination is a contagious disease. It is the lighted torch which passes from hand to hand. It is a dangerous gift, which has started many a conflagration. If we are timid as to that danger, the proper course is to shut down our universities.

Children and Environment

We can do little to control the genetic characteristics of children. But, certainly, we can and, we should, try to make the total environment of the child conducive to his growth and development. Now, it is increasingly recognised that the environment is a powerful determinant of educability of children. Biologically, the existence of an individual starts at the moment of conception. Environmental influences begin at the same time.

There are many factors that could, conceivably, affect the brain's development during gestation and thereby affect the child's later intellectual development. The factors affecting the mental activity of the child can be classified as : prenatal, natal and postnatal. It has been established that the socioeconomic status of the parents is highly correlated to the intelligence and achievement of the children. Creativity of the children is also susceptible to the environmental influences.

The critical period for the brain's physical growth being between the fifth and the tenth month following birth, malnutrition at this time may reduce the number of cells in the brain, which has virtually finished growing by the end of the second year. Longitudinal development studies carried out in various countries, especially in Central Africa and Central America,

reveal that malnutrition during the first four years of life leads to mediocre intellectual performance when children reach school age. Nutritional and socio-economic deficiencies are not the only ones involved. The wrong kind of education and, worse, the lack of education, even among children from advantaged homes, may have disastrous consequences for cerebral development.

Many recent studies have shown that animals exposed to an 'enriched' environment have larger cerebral cortices, more glial cells, bigger neurons, more active neurotransmitters, and larger blood supplies to the brain than animals placed in an 'impoverished' or 'stupid' environment. David Krech's work suggests that the richness and responsiveness of early environment affect mental functioning favourably. Kids raised in a stimulating and smart environment gain a sense of mastery or competence. They are found inquisitive, exploratory and imaginative, having a problem-solving approach to life. Thus, by making the environment rich, varied and challenging, we can make the children's brain more alive and alert. A smarter environment, probably, makes smarter people.

The abrupt transition of the children from the intimate home environment to the unfamiliar world of school is a traumatic experience for majority of the children. "The fact that many of the children" says late K.G. Saiyidain "are able to get over the ordeal without suffering more damage than they do, is more a tribute to their power of survival than to the teachers' intelligence". Current school practices, also, often result in "intellectually burned" students. Children who, by the time they complete elementary school, have experienced frustration and failure so repetitiously that they view themselves as incapable of intellectual competence and see learning as incapable of affording them satisfaction, much less real joy. It is, therefore, argued by William D. Rohwer and D. Elkind that formal schooling (in its present form), prior to adolescence, should be abandoned or it should be radically changed. The longer we delay formal instruction, up to certain limits, the greater the period of plasticity and the higher the ultimate level of achievement. Autonomous elaborative activity emerges

more forcefully only after the Chronological age of (about) eleven, which is the prime time for education.

Although material poverty adversely affects the growth and development of the child, yet the parents can make up this deficiency by their love and sympathy. Researchers tell us that brain operates on an emotional bias system. Affective treatment tend to sustain the involvement of children in learning tasks. Dolly Taft is right when she says that "it should also be made clear that a home which is good may be modest materially even poverty stricken. Wealth is not the only criterion. Poverty no doubt, makes it harder for the child to get security, but kindly and sensible parents can make the happiest environment for their children, whereas a wealthy businessman and a careless mother may make a wretched home for them".

On the other hand, the schools should provide for its pupils a rich, pleasant and stimulating environment which will evoke their manifold interests and make life a matter of joyful experience. Let us not, in the pride of our technical and scientific knowledge of psychology or biology belittle the cathartic value of work and play, love and sympathy, freedom and 'Yoga' in the child's life.

Human Brain and Information Processing

The central nervous system (CNS) consists of the spinal cord and the brain. The brain is conventionally divided into three major regions: the hind brain, the mid brain and the fore brain. The major divisions are made on an embryological basis. Each develops from a different embryonic layer and is roughly related to different evolutionary stages in the development of the vertebrate nervous system. It is estimated that the human brain is capable of processing from ten to one hundred billion bits of information in a lifetime.

Hind brain and mid brain structures have traditionally been thought to control the more automatic, unconscious aspects of behaviours. These include basic functions essential to life such as breathing, the sleep-wake cycle, and levels of arousal or degrees of responsiveness to external events. It is becoming more apparent that these deeper structures of the brain also contribute to the processing of information necessary for higher neural functions.

The fore brain has two hemispheres—the left and the right. It is common to divide each hemisphere of the cortex into four lobes. These are from front to back: frontal, parietal, temporal, and occipital. Each lobe serves different sensory or motor functions. The occipital lobe is a visual centre. Parts

of temporal lobe are involved with hearing. The anterior part of the parietal lobe is concerned with somatosensory functions. The posterior part of the frontal lobe mediates motor functions.

All lobes in man can be divided into zones that are termed associational. The sensory and motor zones are areas for bodily sensation, such as touch and temperature, and regions concerned with the control of muscular contractions. Sensory zones contain neurons that receive information from sensory organs and further process this information. The association zones function neither as sensory analyzers nor motor programmers. It concerns itself with the more cognitive aspects of behaviour. In short, it is probably the association cortex that separates us from our fellow creatures.

The fore brain (or cerebrum) is the largest and most highly developed section of the brain in humans and higher animals. It consists of a complex of anatomically distinct groups of nerve cell bodies called nuclei, which are surrounded by nerve fibres sheathed in myelin and covered by the cerebral cortex. The cortex forms the familiar convoluted (wrinkled) surface of the brain and consists of multiple layers of complexly interconnected neurons. It is the 'newest' structure in evolutionary terms and is well developed only in mammals. It is most expansive and wrinkled in humans. The neocortex, as most of the human cortex is called, contains approximately nine billion of the twelve billion neurons of the central nervous system. It is generally considered to be responsible for the highest functions of the human brain, such as abstract thought and language. Thinking is the outcome of the action of from ten to one hundred billion neurons constantly firing and exchanging information among themselves.

The unit of the brain is the neuron. The brain of a man at birth has been estimated to contain between 20 to 200 billion neurons. We never have more neurons than when we are born. After birth we lose thousands daily never to be replaced. Each of these neurons, communicates with as many as a thousand other neurons, making the total number of connections and the wiring diagram very complex indeed. Neurons are very similar across species. Although the

neurons of lower organisms communicate with one another primarily by 'electrical' contacts between neurons and those of higher organisms (vertebrates) communicate with one another primarily by 'Chemical' contacts. Each neuron consists of three major parts dendrites, cell body and axon. Neurons come in a variety of shapes and sizes : some with one or two processes extending from the cell body of the neuron; other with richly branching processes resembling a tree in winter. Neurons are specialized for the integration and transmission of information. The short branching process extending from the cell body are dendrites (known collectively as the dendritic tree). These processes receive information from other neurons. The long process is the axon, which is often covered with the myelin sheath. Information is transmitted along the length of the axon which ends at another neuron or at a muscle. The neuron has a normal direction of operation. Information is input at the region of the dendrites, and the results of a neuron's processing are output via the axon.

The axons of each neuron are coated with a fatty substance called myelin. Heavily myelinated axons conduct information more rapidly from one cell to another than do less myelinated axons. Thus, enabling greater amounts of information to be processed in shorter periods of time. The more numerous the dendrites, the wider the range of neural connections, and the greater the possibility of taking in and processing information. Ten to one hundred billion neurons interacting with a thousand each at one time implies that the brain is capable of processing from ten to one hundred billion bits of information in a life time.

Research on rats has shown that the production of myelin is heavily influenced by the presence or absence of two factors : emotional closeness and enriched experiential learning environments. An abundance of physical affection and the presence of complex problem-solving learning tasks stimulated the production of myelin, and significantly improved dendritic branchings. Researchers tell us that the brain operates on an emotional bias system. Only information that is perceived

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